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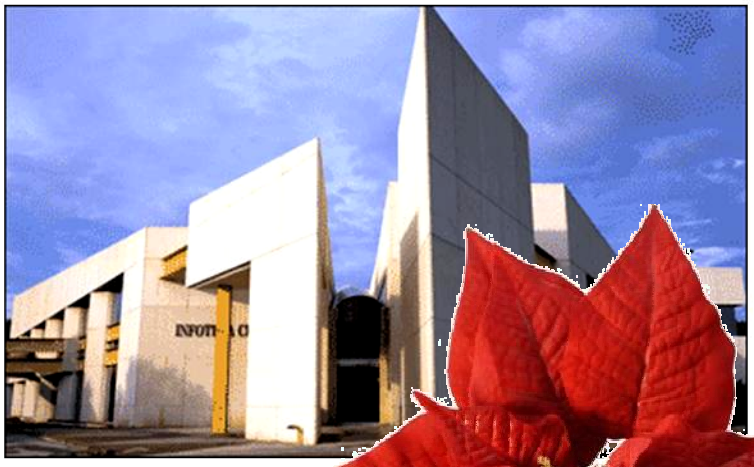

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***Quailing Before the Messy Business of Science***

By: Joan Melcher

Recent events are showing that, in the contact sport of climate change science, reasonable people on both sides may have cause to fear that the loser will be the scientific method.

As scientists, policymakers, diplomats and environmentalists begin to converge on Copenhagen for climate talks, the integrity of leading climate change researchers has come under attack; a release of some 1,000 hacked e-mails from the University of East Anglia in Britain has created a stir, with some suggesting the e-mails demonstrate hoarding of and manipulation of data by climate researchers.

The e-mails were written by the "A-team" — members of the Intergovernmental Panel on Climate Change — and raise questions if the work of other respected scientists may have been disregarded or hampered by a climate change orthodoxy (or "climate oligarchy") that does not value, indeed may discourage, informed debate and dissent. The hope of presenting a unified front may have trumped the messy process of determining scientific consensus.

Adding to the distress is that scientists were supposed to be the good guys fighting to get the facts pushed through the political sieve, not sieving the data themselves like politicians.

These fears recall the resignation of Christopher Landsea from the IPCC after its panel chair reported in a 2005 news conference that global warming was a factor in the severe 2004 hurricane season in the Atlantic Ocean. Landsea, then a meteorology researcher with the National Oceanic and Atmospheric Association and author of the first two IPCC assessments on hurricanes, countered that there was no peer-reviewed science to substantiate that claim.

More recently, papers published by respected scientists from the same university, differed on a key element of climate change science, but the study conducted by IPCC members suggesting acceleration of a trend that would impact global warming received the most attention.

Is this just elbowing among scientists who are playing at the top of their games or a march-step method in approaching science that should concern the public and policymakers?

**Who's On First?**

Let's look at the two studies recently released. The study by the IPCC members received big play in London's *Guardian* newspaper, with the headline heralding a prediction that global temperatures would rise by 6 degrees C by the end of the century — a suggestion of the paper but not its key finding. This paper, by scientists researching under the umbrella of the Global Carbon Project, was published in Nature Geoscience. It focused on trends in carbon sinks and found the fraction of anthropogenic (human caused) CO2 in the atmosphere likely increased from 40 to 45 percent between 1950 and 2008.

About the same time, another paper was published in Geophysical Research Letters, a small but respected scientific journal, and it turned many heads. The findings: The fraction of anthropogenic carbon released from emissions has remained constant in the atmosphere since 1850.

One of climate science's main focuses is the capacity of land and sea to absorb CO2; if "carbon sinks" lose the ability to sequester carbon, more CO2 will remain in the atmosphere, likely escalating warming. The pertinent question is, are the sinks beginning to lose their ability to absorb CO2, and if so, at what rate?

Wolfgang Knorr, the author of the second study, couldn't find a trend from 1850 to 2007; Corrine LaQuéré, lead author of the first study, said an increase from 40 to 45 percent between 1959 and 2008 was "likely."

Both papers are on the cutting edge of climate science, and both lead authors research at the University of Bristol. The university was quick to acknowledge both studies in a press release, note small differences in approaches and include quotes from the authors, who reiterated that global warming is quite real, more research is needed, and reducing emissions of CO2 should be considered a top priority.

A few days later, the blogosphere erupted with news of the hack of some 1,000 e-mails and 3,000 documents from the Climatic Research Unit at the University of East Anglia, posted on The Air Vent, a skeptic blog.

Skeptics and climate change "deniers" were quick to jump on the e-mail messages, some of which suggested manipulation of data to support a warming trend. A few e-mails seemed to indicate an attempt to keep scientific papers by skeptics from publication and still more that dismissed requests for information under the Freedom of Information Act.

Environmental reporters for *The New York Times* and *The Washington Post* covered the story, inevitably dubbed "climategate," giving IPCC scientists a chance to explain the e-mail exchanges. One scientist mentioned he used a statistical "trick" to hide a decline in a warming trend, and another bemoaned the record-cold temperatures in Colorado in October, writing, "The fact is that we can't account for the lack of warming at the moment and it is a travesty that we can't."

Michael Mann, a professor at Pennsylvania State University (famed for his tree-ring-based "hockey stick" graph of global warming) and one of the authors of the hacked e-mails, explained that scientists often use the work "trick" to refer to a way of solving a problem, i.e. "that'll do the trick." Keith Trenberth, a lead author of the 2001 and 2007 IPCC assessments, acknowledged he wrote the "travesty" e-mail cited above but said that it was taken out of context - that he was referring to the need for better recording of global warming anomalies.

As the blogs of skeptics and deniers were lighting up over the e-mails — "catnip to these guys," as comedian Jon Stewart put it — Trenberth depicted the leak as a political move to influence discussions on climate change at the Copenhagen talks. It was likely an accurate statement but one that doesn't change the e-mails' content, just as the e-mails themselves "do nothing to undermine the very strong scientific consensus ... that tells us the earth is warming, that warming is largely a result of human activity," as NOAA director Jane Lubchenco told Congress.

The e-mails are having an effect. Early this week the director of the Climate Research Unit, Phil Jones, stepped down pending an investigation by Sir Muir Russell into both allegations that he overstated the case for human-caused climate change and into the data itself; Penn State reported that it would conduct an inquiry into the e-mails sent by Mann.

Andrew Revkin, author of the Dot Earth blog for *The New York Times*, has posted on the incident frequently, including a letter written by Judith Curry, a Georgia Tech climate scientist who accepts the reality of climate change but who is known for engaging climate change skeptics in scientific discussion. The letter was addressed to young scientists disheartened by recent events.

She wrote: "What has been noticeably absent so far in the ClimateGate discussion is a public reaffirmation by climate researchers of our basic research values: the rigors of the scientific method (including reproducibility), research integrity and ethics, open minds, and critical thinking. Under no circumstances should we ever sacrifice any of these values; the CRU emails, however, appear to violate them."

In an earlier post to ClimateAudit.org, Curry wrote that the hacked e-mails raised two concerns for her: the lack of and need for transparency — how data is treated and manipulated and the assumptions used — as well as the growing tribal nature of some groups of scientists. She noted that she was welcomed into the "tribe" when she published a paper that suggested global warming could be causing more severe

hurricanes, but shunned after she congratulated a skeptic, Steve McIntyre, when his blog, ClimateAudit.org, was named "best science blog" of 2007 through a Web poll.

Amid the increasing calls for CO2 reductions by many climate change scientists and persistent attacks of their science by "deniers," what may have been lost to the general public in recent years is that many scientists have dissented from what they see to be inaccurate or premature conclusions of some IPCC scientists and a closing of gates on scientific inquiry.

One noted skeptic is Princeton University physics professor William Happer, whose climate war credentials include being fired — over climate issues — from the Clinton administration Department of Energy (he reports being proud of being fired by Al Gore) and sitting on the board of the climate-skeptical George C. Marshall Institute.

Happer, a particle physicist and member of the National Academy of Sciences, is among a group of physicists petitioning the American Physical Society to conduct an assessment of its statement on climate change. More than 200 members of the society have signed a petition calling for "an independent, objective study and assessment of the science relative to the question of anthropogenic global warming ... that reflects the current state of scientific knowledge and its uncertainties."

Happer told Miller-McCune the Earth has been in a warming pattern for 200 years, and it is likely increased CO2 has contributed to the warming, but he contends that CO2 is "a bit player" in climate change, and scientists should consider paleontology records of levels of CO2 in the planet's atmosphere.

"I think it's some natural phenomenon that we don't understand very well," Happer said and then suggested what might be the cause in response to a question about reliability of computer models in predicting climate change.

"Computer modeling is difficult for a system as complicated as the Earth's climate," he said. "Everything is happening on the Earth — the sun is shining, the clouds are drifting by, the ocean currents are changing — everything you can imagine. So you have to simplify the model because you really can't model all that. It's just too complicated. ... Where they've probably completely blown it is in the treatment of clouds. I think the cloud physics probably provides a limitation as to how much warming you can get on the Earth."

Happer said he testified last spring before the U.S. Senate Environment and Public Works Committee and was asked if he thought global warming was a hoax. He said, "No. I think it's a mistake. Scientists make mistakes all the time."

After the release of the hacked e-mails, he is even more skeptical about the science conducted by the IPCC panel. He's read the e-mails. "It's just devastating what's there," he said. "Systematic doctoring of the data, destroying embarrassing data, destroying any dissent - it's a devastating read."

He said it's natural for people and even scientists to go along with science that has the sanction of the United Nations and is covered as a certainty by the media. "The press has invested a lot in supporting all the global-warming frenzy, so it's going to be very hard for them to back out of this in a graceful way. They've got many reporters, and all they've ever done is report on the impending apocalypse."

**Politicization**

Climate scientists on the whole, Landsea among them, don't share Happer's specific views about global warming, but they have experienced politicization in the process of scientific inquiry.

In his resignation from the IPCC, Landsea wrote that the IPCC had become politicized to the point where it was using science in a political agenda.

At that time, Landsea did not find a strong causal link between global warming and increased or intensified hurricanes in the Atlantic.

Landsea became the center of a hurricane of his own after Katrina struck and climate scientists and administration officials wrangled over the likelihood of Katrina being caused by global warming. In 2006, Salon.com reported that the Bush administration sought to have Landsea speak to the media about hurricanes and global warming while stifling another NOAA researcher, Tom Knutson, whose research did suggest a link.

In an interview with Miller-McCune, Landsea, now the science officer for NOAA's National Hurricane Center, declined to comment on the hacked e-mails other than to say: "The best scientists are those that are very critical of their own work and colleagues' work. And if you lose some of objectivity — and there may be some that have — you get a little bit tainted, and that's unfortunate because what we need desperately are people who are trying to uncover the truth."

When asked about the brouhaha after Katrina, he noted, "The current NOAA policy is anyone can discuss scientific matters with the media with no interference," then added, "I am concerned about how I was allowed to speak and my colleague Tom Knutson, who has a bit of a different viewpoint, was not. That was not appropriate. I did feel like I was a bit of a pawn in 2005, 2006."

Landsea's views on global warming and hurricanes have not changed. Although he believes the Earth is warming and is concerned about its affects, particularly sea level rise, he attributes increased hurricane activity in the Atlantic to natural cycles that he said paleo-oceanographic research has shown have been going on for years. He said the latest computer models are suggesting that tropical storms and hurricanes won't increase significantly — and perhaps decrease slightly — because of increased wind shear.

He noted that the IPCC "didn't do a good job in the last two editions. They made the link between hurricanes and global warming, but they didn't put up the numbers. It's 1 to 2 percent stronger today, maybe 3 percent 100 years from now. That's pretty tiny."

**Two Studies, Two Datasets**

Let's return to the two studies mentioned at the beginning of this article. Miller-McCune interviewed Wolfgang Knorr via e-mail exchange and Steve Running, an author of the LaQuéré study, by phone.

Steve Running, director of the Numerical Terradynamic Simulation Group at the University of Montana and an IPCC author, conducts computer modeling of Earth's forests and vegetation from satellite data. When asked how he viewed Knorr's paper, he said, "This isn't a revolutionary finding or it would be on the cover of *Science*." Noting that he knew Knorr and respected him, Running said the paper was a solid bit of ongoing analysis but not a paradigm shift.

"What Wolfgang did that was of greatest interest was to push this back to 1850. Most of the papers that go after this topic stick with something more like the last 20, maybe 50 years. That's what's particularly interesting here — trying to do the most credible job possible all the way back to 1850."

Running rued the fact that land data that would help in determining estimates of the land carbon sink has been very difficult to measure. "We don't have a way of quantifying land-use change accurately on a year-to-year basis," he said. "Then when you go with Wolfgang — to the pre-satellite era — then you're really out to lunch. You're having to make estimates."

The early data used are drawn from historical data sets, he said, and various assumptions have to be made. "We're splitting hairs of precision trying to understand where the system's going," he said.

"This is an argument or discussion that comes up. At the science conferences we all go off to beer in the evenings, and we good-naturedly battle away. 'How did you get your land-use change for Africa from

1850 to 1950,' I'll say. And he'll tell me, and you drink another beer and then you say, 'Wasn't the Sahara expanding back then?' 'Well, nobody knows if it was expanding from climatological reasons or due to deforestation by the humans.' It's that kind of back and forth we try to hash through."

Knorr would agree with Running that the time span was probably the main significance of his study, but he sticks by his findings of a constant airborne fraction of CO2 and believes they are more accurate than the trend found in the LaQuéré study. He said that, contrary to what is often heard through media reports, "few scientists in the field really believe we are seeing an upward trend in the airborne fraction.

"I even spoke to one of the authors of the other study, and he said the same," Knorr said. "It is only the Global Carbon Project who promote the idea, but important leading scientists in the field, like Ralph Keeling, Martin Heimann, Niki Gruber, Martin and Andrew Manning, are not in the 'club.' What you are seeing is factions fighting for space in the limelight."

"The idea that the trend might go up is based on computer models," he said.

And so, this debate goes on, fueled by genuine scientific inquiry, hopefully not directed or influenced by in-group politics.

Asked for a response to the e-mail hacking, Running replied by e-mail from Copenhagen: "I know most of the people involved. While some of the personal backbiting quotes are a little embarrassing, there was no new data uncovered, no data analysis that has been proven wrong. The denier crowd is desperately trying to make a mountain out of a molehill. No one over here considers this a scientifically significant issue."

When asked what he thought of Knorr's paper, Happer responded that he had a problem with a sentence in the abstract that referred to CO2 emissions staying in the atmosphere, "which has prevented additional climate change."

"There is precious little evidence that climate change has much to do with CO2 levels in the atmosphere," Happer said. "There have been many warmings and coolings in the past 10,000 years where the CO2 levels stayed nearly the same. It reminds me of Soviet science books from the Stalin era, which often had an effusive acknowledgement to Marx, Engels, Lenin and Stalin in the preface, which was then followed by quite good science that had nothing to do with these men and sometimes contradicted their pontifications."

As to the content of the paper, Happer said he "would agree with Knorr's claim that the observationally derived trend is consistent with zero rate of change of the atmospheric fraction" and could not think of a physical reason for the trend to change.

"This paper, and those that come to contrary conclusions have pretty good instrumental data on atmospheric CO2 levels from about 1960," he said, "thanks to the pioneering work of Keeling. The pre-1960 data, which comes from ice core samples, has many more problems. Putting together fundamentally different types of data is fraught with problems."

That last sentence might be one they all could agree on.

***http://www.miller-mccune.com/science_environment/quailing-before-the-messy-business-of-science-1661?utm_source=Newsletter86&utm_medium=email&utm_content=1208&utm_campaign=newsletters***

***Time for Earth's 7-Billion-Person Checkup***

By: Elisabeth Best

Preventive maintenance. It seems like a simple concept: put in a little effort now to (hopefully) save yourself a lot of stress and frustration in the future. It's why we visit the doctor for a checkup every two years or take our cars to the mechanic every 30,000 miles. It makes sense to do little things that are in our control so that we feel like we are doing our part to prevent an out-of-control disaster.

Preventive maintenance can help save money, too. Eating a low-sodium diet now costs less than paying for high blood pressure medication later, and a monthly gym membership is cheaper than a tummy tuck or lipo.

There is a decided cost savings linked to early action, and this also applies to the environment. One example involves the "killer algae" that took over the Mediterranean in 1984 and hammered the native algal species as well as tourism, fishing and diving. Early identification of the same algae off the coast of California in 2000 enabled eradication efforts to begin 17 days after its detection. It was successfully removed at a cost of roughly $2.5 million — much less than the continuing expenses incurred by its Mediterranean hosts.

So why not take proactive steps to take care of the Earth — plant more trees or protect more coral reefs — in addition to reducing fossil fuel emissions? Why not give people incentives to do preventive maintenance now so that we won't have to pay to fix a disastrous mess later?

That's the tone of a new report from The Economics of Ecosystems and Biodiversity initiative (hosted by the U.N. Environmental Programme). It argues that countries incorporating ecosystem services into their national and international investment strategies are likely to see higher rates of return and stronger economies.

**Weighing Costs and Benefits**

The report cites Venezuela's national protected area system, which prevents sedimentation that could reduce farm earnings by about $3.5 million per year, and the planting and protecting of 12,000 hectares of mangroves in Vietnam, which cost $1 million but saved dyke maintenance costing more than $7 million a year, as examples of such high-return investments.

TEEB calls on policymakers to make ecosystem investments a priority and develop a more sophisticated way of evaluating the costs and benefits. More than 100 science, economics and policy experts from around the world worked to produce this report, which comes in advance of the United Nations' Copenhagen climate change conference on Dec. 7.

The study seeks to examine the costs associated with biodiversity decline and the costs and benefits of fighting it. It also hopes to develop "toolkits" for policymakers to foster conservation and sustainable development, facilitate access to important information about improving biodiversity for the business community, and raise public awareness of the individual's impact on the environment — and how it can be positive.

The official goal of the Copenhagen conference is to stabilize greenhouse gas emissions in the atmosphere to prevent dangerous manmade climate changes without endangering food security or preventing sustainable social and economic development.

It's not likely to be easy. In one of the more optimistic estimates, the Stern Review of the Economics of Climate Change found that 1 percent of global GDP, which is the amount currently spent on global subsidies, would be sufficient to prevent future climate change damage — damage that is expected to cost between 5 and 20 percent of global GDP. TEEB suggests reforming environmentally harmful subsidies,

like those that promote the production and consumption of fossil fuels, to free up funding for resource-efficient, equitable growth.

The TEEB report calls for preventive maintenance that includes creating a valuation system for ecosystem services, investing in conservation efforts, increasing protected areas on land and at sea, providing incentives for people to act as "exceptional national stewards," and making the polluter pay.

Putting a monetary value on ecosystem services is not a new idea: A *Miller-McCune* article by Matt Jenkins, "Mother Nature's Sum," discusses the implications of assigning a dollar value to natural capital, since traditional economic models frequently undervalue or overlook the value of our planet's natural resources.

It is an early economics lesson that in society, there are certain goods and services that benefit many, but it's in no single person's immediate self-interest to develop or maintain them. In modern society, it is frequently the role of the government to maintain these goods and services: Public schools, parks and highways are uncontroversial examples.

Ecosystem services are the resources and processes provided by natural ecosystems. They are not usually accounted for in markets because they fall into this category of public goods; they are accessible to many and do not compete for consumption. Many people benefit from ecosystems services, most notably the world's poor, but these services are consistently undervalued or ignored because they are not an obvious part of most financial equations.

Too often, decisions that affect biodiversity, such as logging in the rainforest, do not take into account the ecological costs. These decisions are usually based on the potential profit to be made by a private firm or individual or their effect on the local economy, but the potential environmental costs of these actions are rarely factored into the equation and usually aren't even calculated.

One example TEEB highlights is commercial shrimp farming. Subsidized commercial shrimp farms can post profits of around $1,220 per hectare when they clear mangrove forests. But these profits do not account for the losses to local communities of about $12,000 per hectare. These losses include the wood and non-wood products produced by the forests, the protection the forests provide from storms and tsunamis, and the potential income that could be generated by local fisheries without degrading these same areas. Profits also do not take into account the costs of rehabilitating the sites, which, after five years of exploitation, is about $9,000 per hectare.

The Te Papanui Conservation Park in New Zealand is another example. The park provides the Otago region with free water because its 22,000 hectares of tussock grass act as a natural catchment. This saves the people who live there an estimated NZ$136 million: NZ$31 million in hydroelectricity, NZ$93 million for urban water supply and NZ$12 million for irrigating farmland. The benefit of conserving this land, then, is equal to the potential cost of bringing in the (currently free) water from elsewhere. But if a private firm were to purchase the land, it would likely weigh the potential profits to be made off its various future uses and would not be responsible for the additional water costs incurred by the region's residents.

Many cities around the world rely on protected areas to provide their residents with drinking water: Rio de Janeiro, Tokyo, Melbourne, New York and Jakarta are a few. The water that these forests, wetlands and protected areas provide often costs much less than a manmade solution. There is an economic benefit, then, to maintaining these protected areas — a benefit that, under our current system, would only be quantified after the water they provide is no longer available.

The consequences of dismissing the benefits of these protected areas are evident in the case of New Orleans, as "The Grass Floodwall: Gustav Highlights the Need for Wetlands" illustrates. Approximately

217 miles of coastal wetlands were lost in hurricanes Katrina and Gustav alone, and Louisiana is losing about a football field of wetlands every 38 minutes.

These wetlands provide an estimated $23 billion of storm-protection services for its residents. Infrastructure improvements like levees and floodgates cannot protect New Orleans on their own; they must be paired with ecosystem restoration on the coast.

More than 1 billion people are dependent on protected areas for a significant portion of their livelihoods, according to the 2005 U.N. Millennium Project. The TEEB report argues that the preservation of these ecosystems and others is essential to the survival of the rural poor.

But in addition to maintaining existing protected areas, it is important to increase their numbers. Protecting more ocean and forest areas can preserve our stores of green and blue carbon (for more on the different types of carbon, see "Your Guide to the Carbon Rainbow" and reduce emissions of greenhouse gases.

**Rewards for Going Green**

"Payments for ecosystem services" programs are another way of increasing green carbon stores. These reward people who take on the task of exceptional environmental stewardship. One of the largest such projects is the Grain-to-Greens Program in China. Designed to combat soil erosion, it pays participating households the equivalent of $450 per hectare for converting cropland with steep slopes to forest and keeping it that way. By the end of 2006, it had contributed to the conversion of 9 million hectares (22.3 million acres) of cropland.

Other payment efforts include the Reduced Emissions from Deforestation and Forest Degradation program. REDD seeks to tip "the economic balance in favor of sustainable management of forests so that their formidable economic, environmental and social goods and services benefit countries, communities and forest users while also contributing to important reductions in greenhouse gas emissions. The aim is to generate the requisite transfer flow of resources to significantly reduce global emissions from deforestation and forest degradation."

In short, REDD would have developed countries pay their less-developed counterparts to follow a more sustainable path to development than they themselves traveled.

The Economics of Ecosystems and Biodiversity report proposes a newer model, to be called REDD-plus. Close to 20 percent of current greenhouse gas emissions are linked to deforestation, and the idea behind these programs is that preventing the deforestation and degradation of rainforests can reduce emissions and create a cash flow from wealthy countries in the global "north" to their southern neighbors.

The report argues that reaching an international agreement on REDD would reward global carbon sequestration and storage services, and also maintain forest ecosystem services. As it stands, REDD would halt further degradation but would not provide incentives for reforestation. Expanding to a REDD-plus variant, TEEB believes, would further incorporate conservation, sustainable management of forests and enhancement of carbon stocks.

The cost of this REDD-plus instrument has been estimated at between $17 billion and $33 billion per year. It could lead to an estimated halving of deforestation rates by 2030, with a long-term net benefit estimated at $3.7 trillion. However, there is a huge benefit to implementing it now. These potential benefits could decrease to $500 billion if implementation is put off 10 years.

Providing incentives for preventive ecosystem maintenance is a different approach to mitigating climate change than the much-discussed carbon taxes or cap-and-trade, although it would need to be implemented in conjunction with emissions-reduction legislation. At Copenhagen, governments are expected to

approve funding that protects and increases the world's green carbon stores, but it is important that they develop a framework for cutting down greenhouse gas emissions as well.

Ultimately, TEEB recognizes the necessity of effective policy in solving the problem in climate change and suggests that preserving our natural resources now is more economically efficient in the long run than paying for alternatives in the future.

And even though this suggestion is hardly a revolutionary idea, a little preventive maintenance is just what the doctor ordered.

***http://www.miller-mccune.com/science_environment/time-for-earths-7-billion-person-checkup-1657?utm_source=Newsletter86&utm_medium=email&utm_content=1208&utm_campaign=newsletters***

***This Import Might Preserve American Jobs***

By: Judith D. Schwartz

As the U.S. unemployment breaches the 10 percent mark — with manufacturing sector rates even higher — policymakers and industry representatives in the Midwest are seeking strategies to keep the Rust Belt from getting even rustier. In this war for economic survival, groups in cities like Cleveland, Detroit and Chicago, as well as the million-plus-members-strong United Steelworkers Union, have turned to a model borne of another war-torn region: the Mondragón Corporation in the Basque area of Spain.

The Mondragón Corporation (MCC) is a multilayered organization with worker-owned cooperatives and participatory governance at its core. The corporation is a group of cooperatives and cooperative members, a seat of governance as well as planning, researching and generating funding for new businesses — a kind of meta-cooperative.

The network is comprised of more than 250 distinct, independently run businesses across several industries; more than 100 are worker-owned cooperatives. Some 90,000 people work under the Mondragón umbrella. Taken together, MCC's companies are the seventh largest corporation in Spain and rank among Europe's leading providers of appliances and industrial equipment.

Mondragón has long been a mecca for Americans interested in worker cooperatives. This is in part for the democratic values — shared financial stake in business' success without the threat of outside ownership; one-worker, one-vote governance; and an ethos that values people over profit — but also because of its success. Last year, while Spain's economy languished, Mondragon Corp.'s income rose 6 percent, to 16.8 billion euros. During the 1980s, when Spain's unemployment hit 27 percent, Mondragón's hovered below 1 percent.

**Brownfield Development**

In 1941, Catholic priest Jose Maria Arizmendiarrieta found a Basque community — Arrasate, as Mondragón is known in Basque — where the striking mountain vistas and picturesque medieval architecture couldn't hide the ravages of the recently concluded Spanish Civil War, rampant unemployment and a once-thriving manufacturing infrastructure in disrepair. Two years later he opened a polytechnic school. And in 1956, the first cooperative, a stove factory, was launched. A bank and credit union soon followed and new cooperatives sprung up in electronics, tools, bicycles and so on.

At MCC, the resources of all the cooperatives are pooled in the corporation, which gives small and upstart companies financial ballast and economies of scale. A portion of each worker's earnings is retained as "the patronage dividend," which gathers interest; another portion goes to a collective account of the cooperative, as an investment in the business' future. Workers pay membership fees but receive a percentage of revenues, plus higher interest on their accounts when businesses show a profit. Worker-owners are guaranteed employment; should one enterprise fail — and the failure rate is extremely low — jobs will be found in another cooperative.

The bulk of profit is reinvested into the cooperative network: to an education fund, to research and development, to cover potential losses, etc.; a percentage is directed to regional cultural institutions, maintaining vibrant community life. In order to promote economic equality, there are only five pay scales; in a given firm, the highest-paid employee earns no more than eight times the salary of a beginning worker. (The average Fortune 500 CEO's compensation is more than 400 times what his employees make.)

While the very word Mondragón has evoked an "if only" longing for many co-op watchers, the model hasn't taken root in the United States, even if the broader idea of the cooperative has. Michael Peck, the North American delegate for the Mondragón Corp., noted, "There are over 29,000 cooperatives in the

U.S., and 80 to 100 million Americans belong to them." These range from small food purchasing co-ops to large credit unions, and account for $3 billion a year in assets.

But new developments in the industrial Midwest may broaden this. In inner-city Cleveland, the Evergreen Cooperative Laundry opened late last month, the first in a projected consortium of three cooperatives run according to the Mondragón template. On Oct. 27, the United Steelworkers and MCC announced an agreement to team up in forming Mondragón-style manufacturing cooperatives in the U.S. and Canada. Civic leaders in Detroit have consulted with Mondragón representatives and in southwest Wisconsin, plans are underway for the Mondragón-inspired Driftless Foods Co-op, beginning with an agricultural processing plant.

Meanwhile, on Chicago's West Side, Austin Polytechnic Academy is into its third year of offering high school students a combined college-prep and technical training curriculum. In September, a group of Austin Polytech students traveled to Spain and spent four days in Mondragón.

"The school is training the next generation of manufacturing leaders," explained Dan Swinney, executive director of the Center for Labor and Community Research, which helped develop the school. He said that the polytech, part of an effort to revive manufacturing in the now downtrodden Austin neighborhood, is "modeled in part on the Mondragón Polytechnic."

While Mondragón has a business presence in the U.S. — upwards of $200 million a year in mostly industrial products — the Steelworkers agreement marks the first time the Spanish cooperative has joined forces with a North American group.

"The general idea is that, in light of today's economic problems, there's much interest in trying to figure out a way to create jobs that are sustainable and accountable to the workers," said Rob Witherell of the Steelworkers. "This is certainly a step in the right direction." He did not specify a timeline.

Mondragón's Peck said that the disconnect between Wall Street profits and Main Street layoffs has created a hunger for new business structures. "People are beginning to understand that workplace ownership is just as valuable as home ownership," he said.

The newly-opened Evergreen Cooperative Laundry, a state-of-the-art commercial laundry designed for LEED Silver certification, is the culmination of extensive preparation and research on the Mondragón model among several organizations: The Cleveland Foundation; the Democracy Collaborative; ShoreBank Enterprise and the Ohio Employee Ownership Center at Kent State University. Many business ideas were floated, among them a laundry that would serve the local health care community, which includes the Cleveland Clinic, University Hospitals, and the Veterans Administration Medical Center.

"The University Circle area has wealthy anchor institutions that are part of the history of the city's industrial past," said Jim Anderson, who will function as Evergreen Laundry's CEO and is program coordinator at the Ohio Employee Ownership Center. "The neighborhood that surrounds The Circle is poor and underserved, with an average household income of $18,500. We asked: Is there a way to enhance community wealth by employing folks from the neighborhood in worker cooperatives and, at the same time, for them to provide a service to these institutions? Of the nearly $3 billion spent on services and procurements, only about 10 to 15 percent is spent right here in northeast Ohio. We saw in this the opportunity for a for-profit enterprise. The anchor institutions are going to stay here, so why don't' we get jobs that are anchored with them?"

Rather than thriving despite their surroundings, business leaders have an investment in helping the surrounding neighborhood thrive. "We needed to create businesses that would sustain themselves," Anderson says. "These had to be real jobs that would keep people working for the long term."

In fall 2008, a group of a dozen community leaders, professionals and leaders from several universities traveled to Mondragón, which generated yet more enthusiasm about the project, Anderson noted. Alas, this was when the financial system began to unravel. "When we got off the plane, we learned that the bank we were dealing with was sold to a bank in another state," he recalls. "But, still, we got up and kept this process moving — and got here. It's a model we're convinced is replicable, city to city."

Oliver Henkel, chief external affairs officer at the Cleveland Clinic, just returned from a follow-up trip to Mondragón. "These neighborhoods are a base of employment for us, and we prefer to draw on services close by for environmental as well as economic reasons," he says. "While here in Cleveland we can't replicate this model down to the last detail, elements are particularly attractive. In Mondragón, I saw a workforce secure in their jobs working as teams with extraordinary results, plus the security that enhanced wealth creates."

Mondragón is not without its critics. The corporation has subsidiaries in more than 20 countries and so far, these do not have the same cooperative framework. Their retail company, Eroski, has grown rapidly — it operates the largest Spanish-owned food chain — and has more employees than worker-owners. But the company is planning to offer membership to the 40,000 people who work for it.

And no business model can insulate workers from a global economic slide. But worker-members can choose how to confront it and, as has happened, vote to take a temporary pay cut of, say, 8 to 10 percent, to ride out a downturn rather than trim any staff. And, boosters say, the results speak for themselves.

Like many from the U.S. who travel to Mondragón, Susan Witt, executive director of the E.F. Schumacher Society, was struck by the lack of economic disparity when she visited in 2007. "You could tell that no one was wealthy — but everyone was well off," said Witt. Beyond the sense of worker equity she observed, what makes her hopeful about bringing the Mondragón model stateside is the chance to build a resilient production sector. "A huge concern of mine is the loss of production in this country," she said. "The outsourcing of production skills makes us so vulnerable; the memory of production is disappearing. Mondragón shows that there's a dignity and potential in production. That's the lesson to bring here."

The Evergreen Cooperative Laundry is now humming, processing 1,000 to 2,000 pounds of laundry a day from three health care customers. Edward Cole is one of the six workers who run the machines. Cole, 59, learned of Evergreen while living and working at a homeless shelter and was assisted in the application process through Cleveland's Towards Employment program. "It's really great here. It's a good team," said Cole, a Vietnam combat vet who spent 10 years in prison for a crime he says he did not commit. He likes that he has been trained in the use, mechanics and maintenance of every machine.

"If I'm going to become an owner, I want to know what I'm owning." For Cole, the worker-owner model sends a powerful message that he is valued, plus that he can build personal wealth.

Said Evergreen CEO Anderson, "If we're right — and we've been conservative because we've felt obligated not to let this fail — the worker-owners will have in their patronage account $60,000 in eight or nine years. That can help someone buy a home, send a child to college."

"My dream is to own part of this company," Cole said. "Now I have the dreams but don't have the nightmares," he says, referring to longstanding problems with PTSD. "This place is putting that dream in me. I can walk down the street and say, 'That's my company.'"

***http://www.miller-mccune.com/business_economics/this-import-might-preserve-american-jobs-1634?utm_source=Newsletter86&utm_medium=email&utm_content=1208&utm_campaign=newsletters***

***The Swine Flu Vaccine: 1976 Casts a Giant Shadow***

By: Joan Trossman Bien

America was one raw nerve. An unpopular Republican president had left office, leaving behind an unpopular war to wind down. Democrats now ruled both houses of Congress. The sitting president, a Midwesterner whose ascendancy had been historic, came in without executive experience. The country was deeply divided among itself and cynical distrust of government and corporations alike was rampant. It was 1976.

It had been 58 years since the 1918 flu pandemic, called the Spanish Flu because Spain's open reporting on the flu's ravages made it seem more awful than in more censored nations. Survivors of the deadly influenza often censored their own recollections, so the pandemic took a backseat to many of the 20th century's other tragedies. Then an outbreak of swine flu at Fort Dix, N.J, sickened five and on Feb. 6, 1976, one soldier died, and global health officials recalled just how awful a flu can be.

**PROLOGUE**
*March 1918 was a difficult time for the nation. America had waded into the European nightmare of the Great War. Gripped by a patriotic fever, civilians endured food rationing and press censorship. When the call went out for medical personnel to support the troops, doctors and nurses answered in droves, leaving the home front with an inexperienced and depleted medical community.*

*On March 4, the flu broke out at Fort Riley, Kan. The illness was referred to as the "three-day fever," and as the soldiers left Kansas for Europe, this fever went with them. The afflicted were often hale and young — many older Americans still carried some immunity to it as a holdover from the 1889-90 Russian flu.*

*The virus thrived in the trenches and the putrid conditions troops were forced to endure. Many of the soldiers' lungs had been devastated by mustard gas. Casualties were jammed into temporary military hospitals that defied attempts at any meaningful hygiene practices.*

*In August 1918, a far more virulent form of the virus emerged simultaneously in Brest in France, Freetown in South Africa and in Boston. The appearance of this mutated influenza was so sudden and so deadly that some speculated it was a German biological weapon.*

*As the troops returned home on crowded ships and trains, they again brought the virus with them. On Nov. 11, 1918, Americans celebrated the end of the war and Armistice Day by attending large parties and parades. Although nearly 200,000 had perished during the month of October, the flu appeared to have peaked. But the public gatherings, from a public health view, poured gasoline onto a dying ember. The flu exploded across the country in another wave, killing young, healthy adults at 20 times the rate of previous influenzas.*

*Death by Spanish flu was particularly hideous. It often attacked and killed within hours, although secondary infections contributed significantly to the spiking mortality rates. The flu had morphed into a raging hemorrhagic virus. Once cyanosis set in, the patient's face would turn bluish-grey, their lungs filled with bloody froth and the edema slowly suffocated them as they gasped for air. Blood pouring from a victim's nose and mouth, ears and eyes became the hallmarks of this pandemic.*

*Fame and wealth offered no protection. Sigmund Freud's daughter, Sophie, died from influenza as did the daughter of Buffalo Bill Cody. William Randolph Hearst's mother died as did Donald Trump's grandfather and the author of "Cyrano de Bergerac," Edmond Rostand.*

*President Woodrow Wilson fell ill during the negotiations of the Treaty of Versailles and recovered, as did future president Franklin D. Roosevelt. British Prime Minister David Lloyd George, artist Georgia*

*O'Keefe, author Katherine Anne Porter, Gen. John J. Pershing, and visionary Walt Disney all survived the flu.*

*The Spanish flu killed 675,000 Americans, many times more than died in the war. When it was over, the lifespan of Americans had been shortened by 12 years.*

*The world had never seen a devastating holocaust of disease like the 1918-1919 influenza. It killed so swiftly, it is estimated some 25 million died in the pandemic's first 25 weeks, as many as died in Europe's Black Plague and more than the dead from the Great War's battlefields. Approximately half of the world's population had been infected. Recent estimates of the flu's deadly toll range from at least 50 million up to 100 million.*

**ACT I**

The Fredericksburg, Va., *Free-Lance Star* on Feb. 20, 1976, picked up the Associated Press story about the swine flu death. The headline blared "Killer Flu Back On Scene: No Immediate Cause for Alarm."

The story read, "The Center for Disease Control has reported an outbreak of influenza in humans similar to a virus found in swine — and recalling the flu of a half-century ago..."

The *Los Angeles Times* ran a brief update from AP on Feb. 25, 1976. "Blood tests on 241 GIs 'showed evidence' that 63 may have contracted and recovered from a swine-type variation of Influenza A, the Army said Tuesday. An Army spokesman said that in some of the 63 men, the virus apparently created antibodies that helped dispel the disease. He said all of the men had been in recent contact with five soldiers who were stricken with swine flu. One of the five died."

*The Washington Post* on March 24 wrote that President Gerald Ford was considering a flu immunization program that would be the largest in this country's history. "Government experts, backed by the recommendations of two advisory committees, decided that all 215 million Americans should receive protection against the swine flu. ... Most health experts believe that the new type of swine flu will spread around the country next winter."

The publicity machine of the federal government was gearing up with the full cooperation of the press.

On March 30, the *Toledo* (Ohio) *Blade* played down the flu danger. A microbiologist at the Mayo Clinic was quoted saying the same swine flu virus that was so worrisome to the government had been isolated from a cancer victim. The scientist concluded that this virus may have been "occurring undetected for years in America without causing the epidemic officials now fear."

On the same day, the AP reported the government line: "Nobody knows for certain whether there will be a flu outbreak in the U.S. this coming winter, but the risks are too high to gamble on doing nothing, officials said as the medical drama unfolded."

The director of Public Citizen's Health Group, Dr. Sidney M. Wolfe, sounded a warning of possible serious side effects from the vaccine. On April 11, he wrote an essay in the Los Angeles Times in which he cast doubt on the similarity between the one case of swine flu at Fort Dix and the 1918 pandemic.

Most worrying to Wolfe was a request by one of the four pharmaceutical manufacturers for the federal government to relax standards for testing the toxicity of the vaccine in order to ensure an adequate supply. He said now the risk of illness had switched to the vaccine itself.

Citing a complete absence of the reappearance of the swine flu in the two months since the death of the one soldier at Ft. Dix, Wolfe said, "Unless there is a real need and unless the preventive measure is

effective and safe, relative to the disease it seeks to prevent, the prevention or 'cure' may be worse than the disease."

A new wrinkle in the government mass immunization plans appeared on April 12 in the *Los Angeles Times*. The president of the Pharmaceutical Manufacturers Association explained that since the industry had not been able to get statutory immunity in the case of possible adverse reactions to the vaccine, the companies now were simply refusing to make it. "The planned mass immunization against the swine flu next fall may be jeopardized by a Senate committee's recommendation that vaccine makers be liable for any adverse reactions," he said.

Two weeks later, in its April 26 issue, *Time* magazine wrote that the vaccine makers had been granted their request by the federal government to lower the manufacturing standards. "It has obliged them by dropping one of its new mandatory measurements for impurities in vaccines."

Polio vaccine developer Dr. Albert Sabin voiced second thoughts about the vaccination program. The *Los Angeles Times* on May 18 reported on an address that Sabin had recently given at the College of Pharmacy at the University of Toledo. "In my own mind now I am wondering very seriously if it would not be very prudent to make as much vaccine as possible and not use it until there is evidence this virus is spreading in the United States," he was quoted. Sabin was concerned that if the virus returned, an early vaccination might not provide immunity long enough.

The *Los Angeles Times* ran a UPI story on May 19 comparing the 1918 flu pandemic and the 1976 swine flu. It said the 1918 Spanish Flu first occurred at a U.S. Army camp, as did the one case of swine flu in 1976. It mentioned that the 1918 flu killed more than 10 times as many Americans as died in World War I, with 852 deaths occurring in New York City in one day. The article said the 1918 flu virus simply disappeared at the end of the pandemic and scientists had been at a loss to explain where it went or whether it would ever reappear.

On June 3, a UPI story in *Ellensburg* (Wash.) *Daily Record* stated that one of the four companies making the vaccine, Parke-Davis, had made a huge error. Among the 2.6 million doses that it had manufactured, an unknown number had been based on a similar but different flu virus. "Some human test subjects were given the wrong vaccine in the clinical trials which began in April and have covered 3,200 volunteers, 600 of them children."

The immunization program appeared to be headed for complete failure on June 16 when *The Spokesman-Review* out of Spokane, Wash., reported that two of the four manufacturers no longer had liability insurance coverage for the vaccine and that a third firm was about to lose its insurance.

What might have been the death knell for the program occurred June 29. The *St. Petersburg Times* reported that based on the clinical trials of 5,000 people, Sabin had recommended the plan should be scrapped. The studies had shown that older people were already armed with antibodies to the swine flu, and there wasn't enough vaccine to provide so-called "herd immunity" in the rest of the populace.

On July 2, an AP story in *The Free-Lance Star* reported that in light of the vaccine makers' inability to obtain liability insurance, the only option would be for the federal government to indemnify those companies, an idea that was not getting support in Washington. "A House Health subcommittee ... refused to consider an administration bill that would have freed manufacturers of most liability in the massive inoculation program and would have put the responsibility on the government."

The grand plan to ward off a deadly influenza virus pandemic through a massive vaccination program had all but collapsed.

**ACT II**

In July, Americans celebrating the nation's 200th birthday saw large groups gather in patriotic fervor, particularly in Philadelphia. But a mysterious illness at a veterans' gathering in that city breathed a new spark into the near-extinguished immunization plan: Men present earlier at an American Legion convention suddenly became ill; some died within days of the first symptoms.

On July 23, Michigan's *Ludington Daily News* printed a UPI story, "The medical mystery over the American Legion killer disease deepened today. Dreaded swine flu has become less likely and bacteria was eliminated from the list of possible causes of the illness that killed 22 persons and hospitalized scores more."

Still, newspapers began to refer to this new and deadly illness as a "flu-like" disease. In a *Los Angeles Times* story on Aug. 3, the Pennsylvania health secretary was asked if it could be swine flu. "That's a possibility," he said.

A spokesman for that same department added, "It doesn't seem to be related to food poisoning. ... They have flu symptoms. It looks like flu."

The article went on to quote the personal physician of a 60-year-old man who died July 26: "I've had several influenza deaths over the last 30 years, and there are some influenza symptoms here. First you get a cold, and the next thing you know you're sicker than hell, and the next thing you're dead."

On August 17, the *Los Angeles Times* reported the death toll was still climbing. A total of 26 people — all at the American Legion convention — had died within a few weeks.

What would turn out to be a new and novel illness called "Legionnaires' Disease" revived the lifeless government immunization program. The August 23 issue of Time magazine reported the lopsided vote in Congress to shoulder all liability for the swine flu vaccination program.

Scrutiny of the vaccine's possible side effects was intense. The *Los Angeles Times* reported on Oct. 14 that the CDC unwaveringly continued to support the program, saying, "There is no evidence that the program should be curtailed in any way," even after the post-vaccination deaths of 24 elderly people. The bottom of the article noted, "The average age of those who died was 72.1, and all but one had a history of heart disease."

Also on Oct. 14, newspapers reported President Ford publicly receiving his own vaccination in an effort to calm concerns about the vaccine.

On Oct. 26, the *Los Angeles Times* ran a feature referencing the 1918 Flu. Elderly people standing in line to receive their vaccinations recalled what it had actually been like to live through the pandemic. They said they were disgusted that younger people were more afraid of the vaccine than they were of the flu. Remembering the horrors of it, one woman said, "Oh, it's just terrible, dreadful. You get a sore throat, high fever, vomiting, and finally you can't breathe anymore at all. It's the worst way to watch someone die."

On the first day that swine flu shots were available to the general public, only 5,030 people in Los Angeles County showed up to receive the immunization.

On Dec. 15, a new reason to skip the vaccine made headlines. The *St. Petersburg Times* combined AP and UPI reports and wrote, "Federal health officials said ... they are investigating reports that at least 30 persons who received swine flu shots later developed a temporary paralysis. The national CDC said it picked up reports of the paralysis, known as Guillain-Barre syndrome, through its own extensive flu surveillance network." The syndrome's cause is unknown but the onset is often associated with infections, surgery, influenza and vaccines.

On Dec. 16, 1976, the federal government shut down the mass swine flu immunization program. A statistical association between the vaccine and the syndrome had been calculated by the CDC.

Guillain-Barre is extremely rare, usually affecting one person in 100,000. In the 1976 swine flu immunization program, 48 million Americans were vaccinated; Guillain-Barre infected 532 people and 25 died.

**EPILOGUE**

As of November 2009, more than 1,000 Americans had died from the current H1N1 influenza, with 48 states reporting this flu. The flu season typically runs from October through March.

Whether the current strain of H1N1, still considered to be mild, will mutate into a more virulent form in another wave, as did the 1918 flu pandemic, remains to be seen.

In 1976, one person died from the swine flu. That strain quickly faded away and has not reappeared. To say that more people died from the vaccine than from the flu is not a universal truth but a highly unusual set of facts. Had the swine flu reappeared, the historic record on the value of the vaccinations would have been different.

***http://www.miller-mccune.com/health/the-swine-flu-vaccine-1976-casts-a-giant-shadow-1655?utm_source=Newsletter86&utm_medium=email&utm_content=1208&utm_campaign=newsletters***

***Who Needs God When We've Got Mammon?***

By: David Villano

From Dostoyevsky to right-wing commentator Ann Coulter we are warned of the perils of godlessness. "If there is no God," Dostoyevsky wrote, "everything is permitted." Coulter routinely attributes our nation's most intractable troubles to the moral vacuum of atheism.

But a growing body of research in what one sociologist describes as the "emerging field of secularity" is challenging long-held assumptions about the relationship of religion and effective governance.

In a paper posted recently on the online journal *Evolutionary Psychology*, independent researcher Gregory S. Paul reports a strong correlation within First World democracies between socioeconomic well-being and secularity. In short, prosperity is highest in societies where religion is practiced least.

Using existing data, Paul combined 25 indicators of societal and economic stability — things like crime, suicide, drug use, incarceration, unemployment, income, abortion and public corruption — to score each country using what he calls the "successful societies scale." He also scored countries on their degree of religiosity, as determined by such measures as church attendance, belief in a creator deity and acceptance of Bible literalism.

Comparing the two scores, he found, with little exception, that the least religious countries enjoyed the most prosperity. Of particular note, the U.S. holds the distinction of *most religious* and *least prosperous* among the 17 countries included in the study, ranking last in 14 of the 25 socioeconomic measures.

Paul is quick to point out that his study reveals correlation, not causation. Which came first — prosperity or secularity — is unclear, but Paul ventures a guess. While it's possible that good governance and socioeconomic health are byproducts of a secular society, more likely, he speculates, people are inclined to drop their attachment to religion once they feel distanced from the insecurities and burdens of life.

"Popular religion," Paul proposes, "is a coping mechanism for the anxieties of a dysfunctional social and economic environment." Paul, who was criticized, mostly on statistical grounds, for a similar study published in 2005, says his new findings lend support to the belief that mass acceptance of popular religion is determined more by environmental influences and less by selective, evolutionary forces, as scholars and philosophers have long debated.

In other words, we're not hardwired for religion.

Paul also believes his study helps refute the controversial notion that the moral foundation of religious doctrine is a requisite for any high-functioning society - what he dubs the "moral-creator hypothesis."

Phil Zuckerman, a sociologist at Pitzer College whose research looks at the link between religion and societal health within the developed world, agrees with that assertion. "The important thing we're seeing here is that progressive, highly functional societies can answer their problems within a framework of secularity. That's a big deal, and we should be blasting that message out loud," he contends.

Zuckerman says the findings are consistent with his own data, collected for his 2008 book *Society Without God: What the Least Religious Nations Can Tell Us About Contentment* — a portrait of secular society in Denmark and Sweden — and his forthcoming *Faith No More: How and Why People Reject Religion.*

Scandinavian countries, in particular, have achieved high levels of economic strength and social stability, and yet the influence of religion there is in steep decline, perhaps the lowest in recoded history.

Coincidence or not, those countries also rank among the world's happiest populations. In The Netherlands' Erasmus University Rotterdam's annual *World Database of Happiness* the same Northern European countries that score low in religiosity rank high in reported levels of happiness. (The U.S ranked 27th).What's their secret? Zuckerman believe it lies in the historically strong sense of community — perhaps a survival response to long, harsh winters - that transcends religious life in these northern climates. Social well-being, economic strength (and happiness) are products of community interaction, not faith, Zuckerman conjectures.

If that's true — and other researchers, such as influential Yale psychologist Paul Bloom, are touting the idea that mass religion's greatest value lies in the web of personal interaction it weaves — then societies that reject religion may suffer if strong secular institutions are not in place to maintain community bonds and foster positive civic associations. Social interactions both inside and outside church structure, Bloom recently wrote, is far more beneficial than "a belief in constant surveillance by a higher power."Indeed, researchers in a variety of other studies are targeting the positive effects of church-based social interaction. One study published earlier this year in the *Journal of Happiness Studies* concluded that the quality and depth of personal relationships has a far greater effect on children's happiness than does religious practice itself — church attendance, prayer, meditation. In many American communities, organized religion is the principal conduit to those kinds of close relationships, as well as to civic action and problem-solving.

Zuckerman warns against hasty emulation of the Danes and Swedes. "We can't just say that secularity is good for society and religion is bad," he warns. "And nor can we say the opposite. The connections are very complex."Paul is less compromising, characterizing organized religion, particularly the conservative Christian brand widely practiced in the U.S., as societal anathema, conspiring against real progress.

In his paper, Paul writes of an "antagonistic relationship between better socioeconomic conditions and intense popular faith" derived from fear that greater prosperity will loosen the grip of religion. That antagonism, though subtle, is evident in the debate over health care, he argues, noting the intense opposition of such groups as the Christian Coalition to universal coverage and other progressive, European-style fixes.

"These groups have a lot to lose in these kinds of debates. When you adopt progressive policy reforms," Paul says, "in the long run, religion is bound to be road kill."Paul, 54, lives in Baltimore and is not affiliated with any university or think tank. He is largely self-taught. He has published three respected books on paleontology, claiming naming rights to a handful of species, and he earns a living as an artist and illustrator of prehistoric creatures. He migrated to the field of secular studies to wage a kind of scholarly assault on the right-wing fundamentalists who challenge both the evolutionary assumptions of paleontology and, it follows, his livelihood.He isn't shy about promoting progressive policy reforms and is quick to blame the Christian right for a range of societal dysfunctions. (A recent study published in the journal *Reproductive Health* found that states whose residents have more conservative religious beliefs have higher rates of teenagers giving birth).

Yet in spite of his findings, and his secularist agenda, Paul stops short of proposing measures to suppress the role and influence of religion in America. Why? It's already happening, he insists. Although we remain largely a nation of believers, our faith and commitment are slipping. Religious affiliation, church attendance and belief in God are all in slow decline in the U.S. A recent Gallup poll found that two-thirds of adults believe the influence of religion in American life is waning, up from 50 percent just four years ago.As these trends continue, he believes, policymaking will more effectively address the true needs of society, rather than the dogma of religious idealism. "People need to know that society without religion is not a bad thing," Paul says. "And we're seeing this in other countries. We don't need religion to have a thriving, prosperous nation."

http://www.miller-mccune.com/culture_society/who-needs-god-when-we-ve-got-mammon-1626?utm_source=Newsletter85&utm_medium=email&utm_content=1201&utm_campaign=newsletters

**Extreme oil: Scraping the bottom of Earth's barrel**

- 02 December 2009 by **David Strahan**

Magazine issue 2737.

The bitumen in tar sands gives the earth a thick, mushy feel. This non-conventional oil is difficult and expensive to extract (Image: Lara Solt/Dallas Morning News/Corbis)

4 more images

EIGHTY-FIVE million barrels. That's how much oil we consume every day. It's a staggering amount - enough to fill over 5400 Olympic swimming pools - and demand is expected to keep on rising, despite the impending supply crunch.

The International Energy Agency forecasts that by 2030 it will rise to about 105 million barrels per day with a commensurate increase in production (see graph), although whistle-blowers recently told *The Guardian* newspaper in London that insiders at the IEA believe the agency vastly over-estimates our chances of plugging that gap. The agency officially denies this.

Wherever the truth lies, it is widely expected that by 2030 we will have passed the peak of conventional oil production - the moment that output from conventional oil reserves goes into terminal decline. A report from the UK Energy Research Centre (UKERC) published in August said there was a "significant risk" it would happen before 2020. And that means we will soon be staring down the barrel of the ultimate oil crisis.

Some governments and corporations are waking up to the idea and beginning to develop alternatives to keep the world's transport systems moving when cheap oil runs out. These include biofuels, more energy-efficient - or electric - cars, and hydrogen. But none of these is likely to make up the global shortfall in time. The pressure is on to keep the black stuff flowing and so the next two decades will see an unprecedented effort to exploit increasingly exotic and unconventional sources of oil. They include tar sands (a mixture of sand or clay and a viscous, black, sticky petroleum deposit called bitumen), oil shale (a sedimentary rock containing kerogen, a precursor to petroleum) and synthetic liquid fuels made from coal or gas.

Purely in terms of geological abundance, these sources look more than sufficient to meet global demand. According to the IEA, taken together, they raise the remaining global oil resource to about 9 trillion barrels (see map) - almost nine times the amount of oil humanity has consumed to date. The trouble is that the name "non-conventional oil" hides several dirty little secrets and a whole host of huge challenges.

Conventional oil refers to liquid hydrocarbons trapped in deep, highly pressurised reservoirs, which means that when the wells are drilled, the oil usually gushes to the surface of its own accord. Non-conventional oils are not so forthcoming, and need large amounts of energy, water and money to coax them from the ground and turn them into anything useful, like diesel or jet fuel.

As a result, non-conventional oil production to date has been slow to expand - with current output of just 1.5 million barrels per day. Not only that, because they take so much energy to produce, they are responsible for higher carbon emissions per barrel than conventional oil.

But, slowly, things are beginning to change. Growing awareness of the impending oil shortage and its ramifications - Deutsche Bank predicts a barrel price of $175 by 2016, for example - has driven a surge of investment in new technologies to recover non-conventional oil more effectively. "Canada could eclipse Saudi Arabia," says Julie Chan, vice-president of finance at E-T Energy, a Canadian company developing a new technique to extract oil from tar sands. So are non-conventionals poised to swoop in and confound the peak-oil doomsayers? Can we expect a new era of expensive, technologically demanding and environmentally damaging oil?

The most famous of the non-conventional resources are the Canadian tar sands, where proven reserves are second only in size to Saudi Arabia's conventional crude. Today, production stands at 1.2 million barrels per day. Tar sands containing bitumen are extracted from huge opencast mines and processed to produce oil. But mining and processing the raw bitumen is expensive and requires huge volumes of water (see diagram). In Canada, the industry is already reaching the legal limits of what can be drawn from the Athabasca river in winter. Worse, mining is only possible for deposits less than about 75 metres deep, and that's just 20 per cent of the total resource. So a whole range of new technologies is now being explored to extract the deeper bitumen.

**Steamy business**

Steam-assisted gravity drainage (SAGD) is one of the most established processes, accounting for almost half of tar sands production. Steam is injected into a well to melt the bitumen, which drains into a secondary shaft from where it is pumped out (see diagram). This is cheaper and uses much less water than mining, but more energy - usually from natural gas - to produce the required steam. An industry-sponsored report published by Alberta Chamber of Resources in 2005 found that if tar sands oil production rose to 5 million barrels per day by 2030, it would need 60 per cent of the gas consumed by western Canada, which it said would be "unthinkable".

But this brand of SAGD is not the only game in town. Nexen, a Canadian oil company, has developed a new twist on SAGD by dispensing with natural gas as fuel and using some of the bitumen to generate the energy needed to produce the steam. At its site in Long Lake, Alberta, the company gasifies asphaltenes - the heaviest fraction of bitumen. This synthetic gas is burned to generate steam for SAGD, and is also used to produce hydrogen which in turn is used to upgrade the bitumen on-site into high quality synthetic crude oil. This makes the process cheaper and energy self-sufficient - it even generates surplus power to export to the grid. The downside is that carbon dioxide emissions are higher than for mining or standard SAGD. The company aims to expand production from its current 14,000 barrels per day to 60,000 by 2013.

A method called "toe to heel air injection" takes a similar approach to SAGD, but does its burning underground. THAI involves a pair of wells. A vertical air-injecting well is drilled close to the "toe" of a horizontal production well (see THAI). Steam is pumped into both wells to heat the bitumen until it is hot enough to combust spontaneously when exposed to air. Then the steam is turned off, and air is pumped down the injector well to feed a horizontal fire front that moves slowly through the reservoir from the toe of the production well towards the heel, generating temperatures of up to 500 °C. The intense heat separates the bitumen into heavier and lighter fractions, with the heavier one (asphaltines) fuelling the fire while the lighter ones melt, flow to the production well and get pumped to the surface. That's a neat trick, because it means part of the refinery's job is done underground. This process uses between 10 and 30 per

cent of the natural gas consumed by SAGD processes. It is even self-sufficient for its water needs, because groundwater is pumped up the production well along with the bitumen and recycled.

A third approach sounds a little more "out there", but in theory has the potential to be the least polluting of all the new bitumen-extraction techniques. Instead of heating the bitumen in a conventional fashion, the idea is to zap it with electricity, using a technique called electro-thermal dynamic stripping process (ET-DSP). A grid of vertical wells is drilled into the tar sands, each containing three large electrodes (see ET-DSP). Current is conducted between the wells via groundwater. The electrical resistance of the earth generates heat which liquefies the bitumen and allows it to flow into a central production well. Changing the voltage gradient between the electrodes allows the operators to direct the electric field to heat the richest parts of the bitumen deposit. Any water that comes up with the liquefied bitumen is re-injected to maintain conductivity. Since the process runs on grid electricity, there's no need for natural gas.

However, on the basis of Alberta's largely coal-fired power supply, the electricity used in ET-DSP means the production process is responsible for more carbon emissions than either mining or conventional crude production. E-T Energy, the company developing the technology, insists that emissions could be slashed if it were powered using hydro, wind or even gas-fired power. In a separate development, Bruce Power, an Alberta-based nuclear power generation company, has drawn up plans for new reactors sited near Canadian tar sands deposits to provide $CO_2$-free electricity to the oil-extraction industry.

Although THAI and ET-DSP seem to have solved some of the practical problems of tar sands oil production, and the costs may fall in the future, they are still in their infancy. IHS CERA, an oil consultancy that recently produced a report on the growth prospects for tar sands production, estimates it will take between 5 and 15 years to commercialise the new technology. "It could be a decade before it is used in enough [tar sands] reservoirs to contribute meaningfully to production," says Jackie Forrest, one of the report's authors.

**Tar sands**

In a scenario most favourable to tar sands - high oil prices, growth in demand and a supportive regulatory framework - IHS CERA predicts output from the Canadian tar sands could reach 6.3 million barrels per day by 2035. That's a small fraction of forecast global demand, but to achieve even this, production would have to grow twice as fast as it ever has. That, says Forrest, "is really pushing it". So what of the other alternatives?

Oil shale is the next large unconventional resource under consideration, with around 2.5 trillion barrels of "oil equivalent" identified. It was used to produce oil before the oil industry took off in the late 19th century. To produce oil from it, you essentially need to speed up a geological process that takes millions of years.

This is done by heating the rock to 500 °C until the kerogen decomposes into a synthetic crude oil and a solid residue. Traditionally that has meant digging up the shale and baking it in a huge oven. An expensive, energy-intensive process. It also leaves a greater volume of waste than the original shale, as testified by the hills of shale slag called "bings" that dot the West Lothian region of Scotland, where a century of shale oil production ended in the 1960s. What's needed is an in-situ production method similar to those developed for tar sands. Three-quarters of the global shale resource (see map) lies in Colorado, Utah and Wyoming, and Barack Obama's administration has recently restarted the process of leasing federal land for shale oil R&D. A number of technologies are being developed to heat the shale underground. These utilise microwaves, high-temperature gas injection, and radio waves combined with supercritical $CO_2$. Such heating creates an oil reservoir that can then be extracted using conventional drilling (see diagram).

Microwaves, high-temperature gas injection, and radio waves combined with supercritical $CO_2$ could all be used to extract oil from shale deposits

Oil multinational Shell has experimented with in-situ shale oil extraction at its development site in Cathedral Bluffs, Colorado. The company drilled bore holes 650 metres deep and inserted electrodes to heat the shale to between 340 °C and 370 °C over a period of months. However, the process is extremely power hungry, requiring energy to both heat the shale and to freeze the perimeter of the reservoir to block the flow of groundwater.

The company says it is unlikely to commercialise the process for at least another five years. The IEA estimates shale oil would cost between $50 and $100 per barrel to produce, without taking into account any carbon-emissions pricing that may come into force. It expects no significant shale oil production this side of 2030.

There's yet another old-school production method that may experience something of a renaissance in the coming decades. Just as shale oil is nothing new, neither is making liquid fuels from coal. Two German researchers developed the eponymous Fischer-Tropsch process in the 1920s, heating coal to produce a gas of carbon monoxide and hydrogen, which is then catalysed to produce diesel and kerosene. The technology was exploited by oil-strapped, coal-rich Germany during the second world war, and by South Africa in the 1980s and early 1990s to beat sanctions imposed during apartheid. South Africa has the world's only major coal-to-liquids (CTL) plant operating today and China has recently built a demonstration plant in Inner Mongolia.

So, could coal be the answer? Few doubt there is enough of the stuff to support a major expansion of CTL (*New Scientist*, 19 Jan 2008, p 38), and the fuels produced are of a high quality. The drawbacks are formidable: it takes about two tonnes of coal and up to 15 barrels of water to produce a single barrel of synthetic fuels. That makes it expensive. The IEA says that when it comes to US coal, to supply just 10 per cent of US transport fuel consumption would mean investing $70 billion, and raising coal production by 25 per cent - an additional 250 million tonnes per year.

Worse, because of the feedstock and energy demands of the production process, CTL fuels have roughly double the carbon emissions of conventional crude on a well-to-tank - or "mine-to-tank" - basis. Carbon capture and storage could be applied to the production plant, but the process is likely to be 90 per cent efficient at best. Then there are still the same emissions as petrol derived from oil when burning it in your car engine. So even with CCS, CTL is always likely to emit more carbon than conventional crude.

The Fischer-Tropsch process can also be used to make liquid fuels from natural gas. As with coal, there is no immediate shortage of feedstock. In fact, prices have slumped as rising gas production in the US and falling global demand combine to produce a worldwide glut which should last for at least the next few years. But, as with coal, there are major drawbacks.

The gas-to-liquids process (GTL) emits much less carbon than CTL, because the feedstock is cleaner, but still more than conventional crude. That's because almost half of the 280 cubic metres of gas it takes to produce a barrel of GTL fuel is burnt during the conversion process. Three small plants account for global production of 50,000 barrels of synthetic fuels per day. That should quadruple in the next few years with the opening of two larger plants in Qatar and Nigeria.

So with huge reserves and up-and-coming technologies, what are the prospects for unconventional sources? Will the non-conventionals be able to fill the gap left by diminishing crude oil, are we doomed to soaring emissions from ever dirtier oil?

Most analysts agree on one thing: despite the enormous size of the non-conventional resource, it will be decades before the new technologies can have a significant impact. In the meantime, any attempt to grow output quickly will have major regulatory and financial hurdles to overcome. In the US, federal bodies are effectively banned from buying non-conventional fuels because of their high $CO_2$ emissions.

Furthermore, Obama has pledged to introduce a nationwide Low Carbon Fuel Standard (LCFS), requiring American fuel suppliers to cut carbon emissions from burning their fuels by 10 per cent between 2010 and 2020. Globally, non-conventionals would be penalised by any carbon-pricing regime that may result from the UN's climate change conference in Copenhagen, Denmark, next week. The IEA is pushing for a carbon-emissions price of $50 per tonne, which it says would add $5 to a barrel of fuel derived from tar sands, $12.50 to a barrel of GTL fuels and $30 to CTL ones.

Oil-price volatility is perhaps of even greater significance. Since the price slumped from its peak of $147 last year, tar sands projects aiming to deliver a total of 1.7 million barrels per day have been cancelled or delayed indefinitely, says the IEA. If price volatility persists - with oil shortages leading to a price spike, leading in turn to recession and a resumption of low oil prices - the halting investment in non-conventional oil development could become chronic.

The IEA's chief economist Fatih Birol says non-conventionals can defer global peak oil to "around 2030". Others are not convinced. "If everything goes well," says Steven Sorrel, the lead author of the UKERC report, "oil sands might produce 6 million barrels per day in 20 years' time, but by then we'll need to add at least 10 times that much capacity - without allowing for any growth in demand. It's very hard to see non-conventionals riding to the rescue."

http://www.newscientist.com/article/mg20427375.900-extreme-oil-scraping-the-bottom-of-earths-barrel.html?DCMP=NLC-nletter&nsref=mg20427375.900

**Low-carbon future: We can afford to go green**

- 02 December 2009 by **Jim Giles**

Magazine issue 2737.

Reducing carbon emissions needn't hit our pockets (Image: John Lamb/Getty)

TACKLING climate change will cost consumers the earth. Those who campaign for a green revolution are out to destroy our western lifestyles. Such are the cries of opponents of emissions cuts, and their message has political clout: a number of surveys, including one by *New Scientist* in 2007, have found that the enthusiasm of voters for policies to alleviate climate change falls off as the price tag increases.

However, a new modelling exercise conducted exclusively for this magazine suggests that these fears are largely unfounded. It projects that radical cuts to the UK's emissions will cause barely noticeable increases in the price of food, drink and most other goods by 2050 (see the figures). Electricity and petrol costs will rise significantly, but with the right policies in place, say the modellers, this need not lead to big changes in our lifestyle.

"These results show that the global project to fight climate change is doable," says Alex Bowen, a climate policy expert at the London School of Economics. "It's not such a big ask as people are making out."

Although it is impossible to precisely predict prices four decades from now, the exercise is one of the most detailed examinations yet of the impact of climate change policies on UK consumers. It provides a useful rough guide to our economic future.

Though its results speak directly to the UK consumer, previous research has come to similar conclusions for the US. In June, one study found that if the US were to cut emissions by 50 per cent by 2050, prices of most consumer goods would increase by less than 5 per cent (*Energy Economics*, DOI: 10.1016/j.eneco.2009.06.016). The findings are also consistent with analyses by the Pew Center on Global Climate Change in Washington DC. "Even cutting emissions by 80 per cent over four decades has a very small effect on consumers in most areas," says Manik Roy of the Pew Center. "The challenge is now to convince consumers and policy-makers that this is the case."

The Intergovernmental Panel on Climate Change recommends that wealthy nations cut their emissions to between 80 and 95 per cent below 1990 levels by 2050 in order to avoid the worst effects of climate change. The UK government aims to reduce its contribution by 80 per cent and leaders of the other G8 nations have discussed following suit. To meet this goal, industries will have to slash fossil fuel consumption, and low-carbon power sources will have to massively expand. Companies will have to pay increasingly higher prices for the right to emit greenhouse gases.

How will this affect the average citizen's wallet? To gauge the impact of the 80 per cent target on the UK population, *New Scientist* approached Cambridge Econometrics, a consultancy known for its modelling of the European economy. The firm used historic economic data to predict the impact of emissions reductions on prices in over 40 categories of goods and services (see "How the model works"). It

compared the impact of the 80 per cent cut with a baseline scenario in which the government takes no action other than the limited emissions restrictions already in place as a result of the Kyoto protocol.

See the figures

Most of the price hikes are a consequence of rising energy costs, in part because coal and gas are replaced by more expensive low-carbon sources. The price of electricity is projected to be 15 per cent higher in 2050 compared with the baseline. In today's prices, that would add around £5 onto typical monthly household electricity bills. It will also result in higher prices elsewhere, as every industrial sector uses electricity.

But electricity and other forms of energy make up only a fraction of the price of most goods. Other factors - raw materials, labour and taxes - are far more important. The energy that goes into producing food, alcoholic drinks and tobacco, for example, makes up just 2 per cent of the consumer price. For motor vehicle purchases and hotel stays, the figure is 1 per cent. Only for energy-intensive industries does the contribution climb above 3 per cent: for example, energy's share of land and air travel costs is 6 and 7 per cent respectively.

As a result, most products cost just a few per cent more by 2050. At current prices, going low-carbon is forecast to add around 5 pence to the price of a loaf of bread or a pint of beer. The price of household appliances such as washing machines rises by a few pounds.

There is one major exception to the pattern. Airlines do not currently have a low-carbon alternative to jet fuel. Unless one is found, they will bear the full burden of carbon pricing, and average fares will rise by at least 140 per cent - raising the cost of a typical London to New York return trip from around £350 to £840.

Achieving the overall picture of low prices does require government action. The model forecasts that by 2050 natural gas and petrol will cost 160 per cent and 32 per cent more respectively. To avoid large price hikes in home heating and road transport while still hitting the 80 per cent target, the Cambridge researchers had to build two major policies into their analysis. They assumed that future governments will provide grants and other incentives to help switch all domestic heating and cooking to electricity, and invest in the infrastructure needed for electric cars to almost completely replace petroleum-fuelled vehicles.

Both policies have been discussed in recent UK government strategy documents, though the detail of how they would be implemented is still pending. Firm policies must follow if ambitious emissions cuts are going to be made, says Chris Thoung of Cambridge Econometrics.

So is tackling climate change going to be easier than expected, in terms of consumer costs? While the Cambridge Econometrics model is widely respected and regularly used by the UK government's climate change advisers, any attempt to forecast four decades ahead can be derailed by unforeseen events. That leads some economists to question the model's results.

For example, companies could relocate to countries with less stringent carbon regulations, points out Richard Tol of the Economic and Social Research Institute in Dublin, Ireland. Incomes in the UK would fall, making goods relatively more expensive. Tol also questions whether it is reasonable to use historical prices as a basis for projecting beyond 2020.

Mike Hulme, a climate policy expert at the University of East Anglia in Norwich, UK, says that social effects are also unpredictable. A repeat of the 2000 fuel price protests, when action by truckers forced the UK government to cut road fuel taxes, could scupper plans to persuade consumers to switch to electric vehicles. Conversely, social effects could make cuts easier - for example, if the high emissions associated with flying stigmatise air travel among some groups, adds Hulme.

Despite this, the Cambridge Econometrics results, together with other recent studies, do provide a useful guide for governments, says Michael Grubb of the University of Cambridge. They suggest that the overall challenge is surmountable, even if many of the details will only become clear in years to come. "No one is asking policy-makers to have everything in place for the next 40 years," says Grubb. "But these results should reinforce the sense that this is a manageable problem."

**The figures**

- **1% on clothing:** A £500 men's suit will become £5 more expensive
- **2% on electronics:** A £1000 laptop would cost £20 more
- **1% on food:** The average UK household spends £50 a week on food. This increases by less than £1
- **15% on electricity:** A typical UK household spends £400 a year on electricity. This will jump by roughly £60
- **0% on communications:** UK phone bills will be essentially unaffected
- **140% on air travel:** A return flight from London to New York would jump from £350 to around £840
- **2% on tobacco:** Barring new taxes, the cost of a pack of 20 cigarettes will rise by roughly 10 pence
- **2% on alcohol:** The cost of a pint of beer will rise by about 6 pence by 2050
- **1% on cars:** A new Toyota Prius, currently about £20,000, will cost £240 more in a low-carbon 2050
- **2% on household goods:** The price of a washing machine will rise by a few pounds

**How the model works**

The model is based on the idea that future emissions cuts will depend on the UK government restricting the amount of carbon that companies can emit. This already happens under the European Union's Emission Trading Scheme.

Companies that exceed a predefined cap must buy emissions allowances from firms that undershoot their target. Emissions can then be progressively cut by tightening these caps. The Cambridge Econometrics team assumed that firms not subject to these limits will have to pay a carbon tax, which will also be steadily increased.

As the cost of emitting carbon rises, so will the price of electricity from fossil-fuel power stations. Petroleum-fuelled vehicles and gas boilers will also become more expensive to run.

Technologies that use less carbon - including nuclear energy and small-scale systems that use the waste heat from power plants to run heating systems - will face smaller price increases. This leads to more investment in low-carbon technologies, which become more attractive as the cost of emitting carbon increases. Consumers will also use less of the goods and services that become more expensive, such as air travel. These effects lead to a fall in emissions.

To calculate the impact on everyday prices, the model uses historical figures that reflect the effect that energy price changes have on the prices of different types of consumer goods.

http://www.newscientist.com/article/mg20427373.400-lowcarbon-future-we-can-afford-to-go-green.html?DCMP=NLC-nletter&nsref=mg20427373.400

**Autism and schizophrenia could be genetic opposites**

- 11:33 02 December 2009 by **Bob Holmes**

Autism and schizophrenia may be two sides of the same coin, suggests a review of genetic data associated with the conditions. The finding could help design complementary treatments for the two disorders.

Though autism was originally described as a form of schizophrenia a century ago, evidence for a link has remained equivocal. One theory puts the conditions at opposite ends of a developmental spectrum.

To investigate, Bernard Crespi, an evolutionary biologist at Simon Fraser University in Vancouver, Canada, and colleagues gathered data on all known genetic variants associated with each condition, then looked for patterns of co-occurrence.

The researchers found four regions in the genome which dramatically affect the risk of autism or schizophrenia. Called "copy-number variants", these are stretches of DNA with seemingly accidental duplications or deletions. Crespi's team found that the presence of a particular variant – a duplication, say – was often associated with autism while the opposite variation – a deletion of the genetic material – was linked to schizophrenia.

The results fit with other evidence that autism may be caused by overdevelopment of specific brain regions and schizophrenia by underdevelopment, says Crespi.

If they are indeed opposites, work on one disorder may inform work on its counterpart, he says.

Journal reference: *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.0906080106

http://www.newscientist.com/article/dn18226-autism-and-schizophrenia-could-be-genetic-opposites.html?DCMP=NLC-nletter&nsref=dn18226

**Transparent universe reveals hidden galaxies**

- 02 December 2009 by **Rachel Courtland**
- Magazine issue 2737.

Seeing blazars so clearly has called into question what we know about star formation and evolution (Image: NASA/Goddard Space Flight Center Conceptual Image Lab)

THE universe is far more transparent at high energies than we thought. This discovery - based on sightings of unexpectedly bright objects that should be too far away to see so clearly - may call into question our understanding of how galaxies are born and evolve.

The universe is more transparent than expected, questioning what we know of galaxy formation

Most light travels through the cosmos unimpeded. But photons with very high energies of more than 100 gigaelectronvolts can collide with intergalactic infrared light. The longer these photons have to travel, the greater their chances of colliding and the less likely they are to reach Earth. As a result, distant blazars - galaxies with gluttonous black holes at their centres whose flares are pointing directly at Earth - are supposed to be much dimmer at higher energies than those that are not so far off.

Based on estimates of the amount of infrared light pervading the universe, blazars more than a billion years old were expected to be mostly invisible to telescopes looking for very high-energy gamma rays, says astrophysicist Simon Swordy of the University of Chicago.

But in 2006, the HESS telescope in Namibia reported the discovery of two unexpectedly bright blazars that are more than 2 billion years old. What's more, bright light from a blazar called 3C279, spotted one night in 2007 by the MAGIC telescope on La Palma in Spain's Canary Islands, survived some 5 billion years of travel. "We can see significantly further than we thought we could," says Swordy.

The mystery grew last month, when the VERITAS telescope in southern Arizona, following up on observations made by NASA's orbiting FERMI telescope, reported the discovery of yet another blazar that glows unusually brightly with very high-energy gamma rays. The new source, named 1ES 0502+675, is 4 billion years old. While it is not as distant as the one discovered by MAGIC, it could provide more

useful information as it is bright, sits at a well-established distance and has been observed steadily for more than a month.

These blazars suggest that the amount of infrared light between galaxies must be quite low. This infrared background is light left over from star formation processes that occur early in the life of galaxies. We can estimate the background by counting galaxies in deep space, but now astrophysicists are beginning to question these estimates. "The amount of infrared is really right at the minimum you would expect from what we know about star formation and evolution," says Rene Ong of the University of California, Los Angeles, and spokesperson for VERITAS. "It's becoming a problem."

Continued observation of 1ES 0502+675 could help solve the puzzle. "This source could produce better and more reliable constraints on the extragalactic background than any source that has come before," says Ong.

http://www.newscientist.com/article/mg20427373.800-highenergy-rays-pierce-foggy-fabric-of-universe.html?DCMP=NLC-nletter&nsref=mg20427373.800

**Cellphones and cancer: Interphone can't end the debate**

- 09:00 02 December 2009 by **Michael Repacholi**

Clean bill of health, but the study could be flawed (Image: Oli Scarff/Getty)

Do cellphones cause cancer? That question is about to be revived with the publication of a long-awaited study called Interphone. Given the public health implications, we can expect it to get a lot of media attention. But you should treat what you read and hear with caution.

A decade ago, when the study was being set up, there were great expectations that it would produce a definitive answer. It is now clear that it cannot.

Interphone was coordinated by the International Agency for Research on Cancer and established on the recommendation of the IARC's parent body, the World Health Organization. It comprises 16 studies in 13 countries that sought to determine whether cellphone use is associated with tumours of the brain (glioma), meninges (meningioma), acoustic nerve (acoustic neuroma) or salivary glands.

Interphone compared cellphone use in 6420 people who had these cancers (2765 with glioma, 2425 with meningioma, 1121 with acoustic neuroma and 109 with salivary gland tumours) with that of 7658 people without cancer. The studies were designed to work out whether those with cancer had used their mobiles for longer or more intensively than the others.

**What we know already**

Although the final results are still under wraps, we have some idea what they could be because many of the national studies have been released with mostly negative results (*Epidemiology*, vol 20, p 639).

Also, the results from five national studies that account for over 60 per cent of the people who participated in Interphone studies have already been combined and published. This research shows no clear link between cellphone use and acoustic neuroma (*British Journal of Cancer*, vol 93, p 842), glioma (*International Journal of Cancer*, vol 120, p 1769) or meningioma (*International Journal of Epidemiology*, vol 37, p 1304), though it could not rule out a possible elevated risk of glioma or acoustic neuroma from using a phone for more than 10 years.

It is therefore likely that Interphone will give cellphones a clean bill of health except for the small possibility of a risk of glioma or acoustic neuroma from intensive and long-term use, which requires further study before reaching any such conclusion. Unfortunately, it is also likely that the media will

report this possible risk without any caveats, such as it probably being due to the limitations of the study, of which there are many.

**Design flaws**

It is widely recognised that the design of Interphone was the best available at the time. Even so, it has major flaws that cast doubt on its ability to identify any cancer risk from cellphones.

Researchers gathered Interphone data by interviewing people about their cellphone habits, their exposure to other sources of radio-frequency (RF) radiation – which cellphones use to transmit calls – and other risks such as smoking. Participants were asked how often and how long they had used their phones in the past, whether they used them in urban or rural areas, whether they were mostly stationary or in motion when they used their phone, whether they used hands-free kits, which ear they used and how their mobile phone use changed over time. They were also shown photos of different phones to identify models they had used.

Can you recall how much you used your cellphone five or 10 years ago? Of course not, and that is Interphone's biggest flaw. Scientific studies on RF health risks are only as good as their ability to assess RF exposure. For Interphone, this is plagued by "recall bias" that can affect the accuracy and reliability of the results.

**Biased knowledge**

Recall bias is made more likely by the widespread dissemination of the hypothesis that Interphone was set up to test – that cellphone use causes cancer. There is evidence that people with tumours overestimate their past use of a phone, perhaps because they "know" that their tumour may have been caused by mobile phones (*Journal of Exposure Science and Environmental Epidemiology*, vol 19, p 369).

A similar bias is seen in subjects' recall of which side of the head they held their phone: those with tumours localised on one side tend to overestimate how much they used the phone on that side (*Scandinavian Journal of Public Health*, DOI: 10.1177/1403494809341096).

A different problem arises from the fact that members of the control group were more likely than the population at large to be cellphone users. This is perhaps because the control group was selected at random, by invitation, and people without mobiles did not see the relevance of taking part. This "selection bias" could lead to an approximately 10 per cent underestimate of any possible risk (*Annals of Epidemiology*, vol 19, p 33).

On top of that, mobile phone technology changed significantly over the course of the study. These changes, such as switching from analogue to digital, have mostly reduced RF exposure. Phone use patterns have also changed, with increased texting and use of speakers and hands-free kits, further reducing RF exposure. In addition, different people hold their phone at different angles to their head and at different distances from their head while talking. This can also result in a huge variation in RF exposure that could not adequately be taken into account in the Interphone study.

**RF in the clear**

Interphone's results must be seen in the light of what is already known about the effects of RF on cells. The vast majority of laboratory studies, when considered collectively, find no relationship between RF field exposure and any form of cancer. All rigorous reviews of all the scientific literature have concluded that exposure to RF fields is not associated with an increased risk of cancer.

Nor has any mechanism been found by which RF exposure from mobile phones could cause cancer. RF fields do not have enough energy to break chemical bonds in DNA, so they simply cannot cause the

mutations required to initiate cancer. Further, from a theoretical analysis of all possible ways that RF fields could act on cells and tissues, it does not seem possible for RF exposures at levels below the international limits to cause adverse health consequences.

Interphone should realistically be considered as a detailed preliminary study that has identified key methodological limitations which preclude the detection of any small risk of brain cancer due to cellphone use, if any exists. It has also shown that these limitations need to be addressed in subsequent studies: for example, tracking actual phone use in a group of people over many years.

Such studies will be needed to get to the bottom of the matter. Some are under way, but they take time. In the meantime public health policy should remain as recommended by the WHO. Over 50 countries have already adopted international standards that limit RF exposure from cellphones. As far as we can be reasonably sure, these guidelines are more than sufficient to protect us.

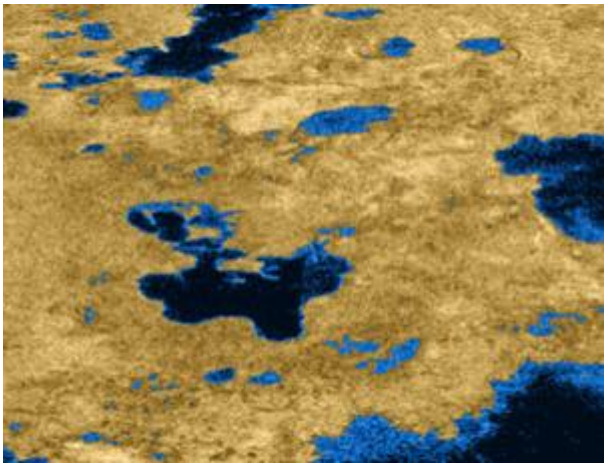
**Further reading:** Reliable information on the health effects of RF can be found on the WHO website

*Michael Repacholi is a visiting professor of electronic engineering at the Sapienza University of Rome, Italy. He coordinated the International EMF Project at the World Health Organization for 11 years and was at WHO when the Interphone project was proposed and commenced. He was founding chairman and is chairman emeritus of the International Commission on Non-Ionizing Radiation Protection*

http://www.newscientist.com/article/dn18223-cellphones-and-cancer-interphone-cant-end-the-debate.html?DCMP=NLC-nletter&nsref=dn18223

**Long-lived Titan lakes are boon to life**

- 21:03 01 December 2009 by **Maggie McKee**



Titan's north polar region is a land of lakes - researchers hope to one day use landers to study the lakes' chemistry and interaction with the atmosphere (Image: NASA/JPL/USGS)

Why is the north pole of Saturn's moon Titan a veritable land of lakes, while its south pole is relatively dry? Changes in Saturn's orbit over tens of thousands of years – rather than seasonal variations lasting a few years – may be to blame, giving any potential life in the lakes a longer time to evolve.

The Cassini spacecraft has found numerous hydrocarbon lakes on Titan since it arrived at Saturn in 2004. But as it mapped the moon, it discovered far more lakes on the north pole than the south.

Since the north pole was experiencing winter during Cassini's observations, researchers suggested that the lakes might be a seasonal phenomenon, filling with methane rain in the winter, then evaporating in the summer.

But a new study led by Oded Aharonson of Caltech argues the lakes are much longer lived, moving between the poles over timescales set by gradual changes in Saturn's orbit.

The researchers mapped the distribution of liquid-filled lakes around the polar regions and found that they cover an area 25 times larger in the north than in the south. "The sheer number of filled lakes in the north compared to the south is amazing," says Erika Barth, a planetary scientist at the Southwest Research Institute in San Antonio, Texas, who was not involved in the study.

**Too fast**

Strangely, the number of dry lake basins is also greater in the north. If the lakes were simply moving back and forth between the poles over the course of a year on Titan, which lasts 29.5 Earth years, the number of dry basins should be the same on each pole.

The depth of the lakes also argues against a purely seasonal explanation. Research suggests that only 1 metre of liquid evaporates from the lakes during Titan's summers – not enough to completely drain or fill the 200-metre-deep basins in a single season.

Instead, the researchers say the lakes wax and wane on cycles lasting about 45,000 years. These are determined by how elongated Saturn's orbit around the sun is – a measure called eccentricity – and the direction of its tilt as it orbits – a measure called precession. Both factors change over time because of the gravitational influence of other bodies in the solar system.

**Intense summers**

At the moment, Saturn's orbit is not a perfect circle – it comes closer to the sun on one side of its orbit than on the other. The planet is also tilted by about 27 degrees relative to the plane of its orbit.

When the planet is closest to the sun, its south pole – and that of Titan – is pointed towards the star. The researchers calculate that the atmosphere above Titan's southern hemisphere gets about 24 per cent more incident solar radiation during its summers.

They say that might lead to differences in the amount of evaporation and precipitation between the hemispheres, explaining the imbalance in the distribution of lakes. On Earth, similar orbital changes seem to serve as "pacemakers" for shifts in climate.

If the orbital explanation is correct, Titan's north pole hasn't always boasted more lakes than the south. Because Saturn and its moons slowly wobble like a top as they orbit the sun, sometimes Titan's north pole should experience shorter, more intense summers than the south. That should deliver more lakes to the south pole, a situation that Aharonson said last occurred about 30,000 years ago.

**Climate probe**

If the lakes move between the poles every few tens of thousands of years, why don't we see the same number of dry lake basins in both hemispheres? Aharonson says sludgy material falling out of the atmosphere as a result of sunlight-triggered chemical interactions may have concealed some of the southern basins over the past 30,000 years.

Tetsuya Tokano of the University of Cologne in Germany says the idea that the distribution of lakes on Titan might be used to probe the history of the moon's climate is "amazing".

But he says there is not yet enough evidence to prove that this hypothesis is correct, a fact that Aharonson acknowledges. "At the moment, there is not a definitive mechanism for going from solar variations in sunlight to [rates of evaporation and precipitation]," Aharonson told *New Scientist*. "We don't know exactly how that works yet."

**Incubation time**

The idea will soon be tested, however. In August, the northern hemisphere of Saturn – and thus Titan – began to be illuminated by the sun for the first time in 15 years. "We will hopefully see within the next few years of Cassini observations whether the lake distribution remains constant on timescales of years and where and when it rains in the north polar region," Tokano told *New Scientist*.

If the lakes do in fact last longer than a few years, that would be good news for the potential development of life on the moon.

"Titan's lakes are pretty cold, so the prebiotic chemistry or organic chemistry in general should proceed at a much slower pace than on Earth," says Tokano. "Should the lakes dry up every 10 years or so, this may simply be too short for any relevant chemical evolution under Titan's condition. Tens of thousands of years are better than 10 years... for astrobiology."

Journal reference: *Nature Geoscience* (DOI: 10.1038/NGEO698)

http://www.newscientist.com/article/dn18224-longlived-titan-lakes-are-boon-to-life.html?DCMP=NLC-nletter&nsref=dn18224

**Split-personality home routers can cut net energy use**

- 08:00 02 December 2009 by **Jim Giles**
- Magazine issue 2737.

Storing internet data in users' homes could save energy in the US alone equivalent to the output of five large power plants.When you watch a video online it streams to your computer from a data centre, probably a distant, giant warehouse full of servers. But if a new proposal is implemented, some data would reside on the modems of domestic broadband users. Press "Play", and your video would come from the homes of other people in your city.Vytautas Valancius at the Georgia Institute of Technology in Atlanta worked with Spanish telecoms firm Telefonica and modem manufacturer Thomson in France on this "Nano Data" project to cut the inefficient way even state-of-the-art data centres use energy.

**Power guzzlers**

Data centres consume much the same energy regardless of how hard they are working. Even in state-of-the-art facilities, cooling can account for 50 per cent of electricity use, and idle servers can use up to 80 per cent of the power they do when working at full tilt.In 2007, US data centres used almost as much energy as 6 million homes. This figure could double by 2011, which would require the construction of additional 10 power plants.Having web users transfer data directly between one another, in a peer-to-peer arrangement like that used by file-sharing networks, has been suggested before, says Sergiu Nedevschi, a computer scientist at the University of California, Berkeley. But companies are wary about handing over control of their data to devices that they don't control.

**Split personality**

The Nano Data idea gets round this problem by effectively dividing a modem and a user's connection in two. One part of the device provides internet access as usual using one part of the connection. The other, which runs the Nano Data system, is controlled remotely by the network operator and acts as a scaled-down data centre. That half downloads and stores web data, without affecting the owner's connection.

When someone tries to access a video, their computer may be directed to download chunks of it from a nearby user's device. Files such as video are the best candidates for distribution in this way, because their large size places a particularly heavy load on data centres.Because home modems are typically left on all day and do not need cooling, energy use can be cut by up to 60 per cent, Valancius's simulations suggest. Christophe Diot, chief scientist at Thomson in Paris, France, says prototype Nano Data devices are being built and will be ready for distributing to users in two years.

**Uncommon content**

"This has significant potential," says Nedevschi, although he points out that the system will work best with popular content that many people want to access: it's unlikely that someone seeking uncommon material will be able to download it from a nearby modem.That's an issue that Valancius and colleagues are aware of. Valancius says that the content provider will still need to maintain a small network of servers to provide recherché content that is not worth storing on modems, or to act as a backup when the local network is overwhelmed.

A paper on the project is being presented this week at the Association for Computing Machinery's Conext meeting in Rome, Italy.

http://www.newscientist.com/article/dn18222-splitpersonality-home-routers-can-cut-net-energy-use.html?DCMP=NLC-nletter&nsref=dn18222

**Seas could rise 1.4m, warns Antarctic climate review**

- 15:21 01 December 2009 by **Shanta Barley**

A review of climate change in Antarctica forecasts that by 2100 the world's seas will have risen to levels previously considered too extreme to be realistic.

The review, *Antarctic Climate Change and the Environment* (PDF), was compiled by 100 scientists associated with the international Scientific Committee on Antarctic Research. Using 20 of the most up-to-date models that take into account the complex behaviour of the ozone hole over Antarctica, as well as the most recent observations of ice loss, the review predicts that the area of sea ice around Antarctica could shrink by 33 per cent – 2.6 million square kilometres – by 2100, leading to a sea-level rise of 1.4 metres.

"This is the first comprehensive review of Antarctic climate change that covers how the climate of the icy continent has changed from deep time," says John Turner of the British Antarctic Survey, lead editor of the report. The report also makes predictions about how the Antarctic climate will change over the next century.

For the past 30 years, the hole in the atmosphere's ozone layer above Antarctica has protected the bulk of the continent from the effects of climate change by generating fierce winds. In that time, sea ice around the continent has increased by 10 per cent.

The new report warns that when the ozone hole heals – and it will, possibly by the end of the century – Antarctica will feel the full force of global warming, with temperatures rising by as much as 3 °C by 2100.

**From sea ice to sea**

The report backs the predictions of Stefan Rahmstorf at Potsdam University, Germany, whose own work suggests that given the speed at which West Antarctica's ice sheets are shrinking, sea levels are likely to rise by 1.4 metres by 2100. In contrast, the Intergovernmental Panel on Climate Change's Fourth Assessment, published in 2007, predicted 59 centimetres.

"I am not the one to judge my own paper, but there is indeed [some] indication that these higher numbers – not only from my study, by the way – are now the new mainstream," says Rahmstorf.

The IPCC's sea-level rise projections are considered to be conservative, as they don't take into account the fact that Antarctica's loss of ice will accelerate as temperatures rise over the continent.

By 2100, the West Antarctic Ice Sheet alone could lose enough ice mass to raise sea levels globally by "tens of centimetres," Turner says.

Despite the transformations climate change will create on Antarctica, the study concludes on an upbeat note: only a few of the continent's species are likely to become extinct by 2100.

Many marine creatures can survive a change in temperature of 5 to 10 °C before dying, but "a rise of this magnitude in the Southern Ocean is extremely unlikely by 2100", the study says.

http://www.newscientist.com/article/dn18218-seas-could-rise-14m-warns-antarctic-climate-review.html?DCMP=NLC-nletter&nsref=dn18218

**Where next for social networking?**

- 12:14 25 November 2009 by **Tom Simonite**


The future of social networking is how it will change people and societies (Image: Cameron Spencer/Getty)

*Innovation is our regular column that highlights emerging technological ideas and where they may lead*

Social networking sites are the culmination of the internet revolution, and there's not much innovation left to come online. So said Peter Thiel, co-founder of web payments service PayPal, at a discussion at the University of Oxford Saïd Business School on Monday.

The event provided a glimpse of where he and other Silicon Valley luminaries think social networks are taking us next.

Thiel, one of the first investors in Facebook, suggested the best way to think about the sector's future is to ask, "Where in the history of social networking are we?" His answer: We're near the end.

"I believe that the computer age culminated in the internet, the internet culminated in social networks, and that we'll have to look extremely far afield for what is next," he said.

While the web and social networks will continue to exist, true innovation will appear elsewhere, he said. "My view is that the last wave of innovation is social networks, and that after that you have to go back to the science fiction of the 1950s for what's next."

**The new email**

Others on the panel didn't go so far. But there was a consensus that the basic way for social networks to work is established, will stay the same and will become ubiquitous, much like email.

"Facebook will replace email," as the dominant method of electronic communication, predicted Ram Shriram, a founding board member of Google.

But he went on to predict that social networking will in future be centred on cellphones, not static machines. "Mobile internet is the next major computing cycle," he said, pointing to the rapid growth of both mobile web use and ownership of internet-capable devices.

**Future products**

Reid Hoffman, founder of professional social network LinkedIn, agreed that there is more social-networking history to come.

"What's interesting is that everyone is now present with their real identities and relationships. We're only just seeing how people lead these things into their lives." Future innovation will involve using the information people put into them, he predicts.

"We're all generating massive amounts of data that will generate interesting applications," said Hoffman. Predicting future economic trends, something Google has done using search queries, is one possibility. "You may get recommendations of who you should meet professionally, or which career path you should take."

**Changing the world**

Twitter co-founder Biz Stone insisted that Twitter "isn't a social network" – a definition some would question. For him, the interesting thing about the future of social networking is how it will change people and societies.

"There's a kind of alchemy that takes place. When you move on from sharing with just a few friends on email there's all this information that takes on a whole new value." Stone thinks Twitter and other sites that make communication more public can genuinely change human behaviour for the better.

"When people are more open, they're more engaged, and they tend to be more empathetic. They become more of a global citizen." Technology that promotes open communication will help us "move forward as a species", he said.

**http://www.newscientist.com/article/dn18196-innovation-where-next-for-social-networking.html?DCMP=NLC-nletter&nsref=dn18196**

**How our brains build social worlds**

- 02 December 2009 by **Andreas Roepstorff** , **Chris Frith** and **Uta Frith**

Magazine issue 2737.

Subconscious imitation is just one of the ways that we socially interact (Image: Jonny Basker/Getty)

YOU know how it works. A student volunteer sits alone in a soundproof booth, watching a computer screen and waiting for moving dots to appear. When they do, he or she has to decide whether there is a walking man hidden somewhere in those dots. If there is, and he is walking left, the volunteer has to press the left button. It's a tricky task, and most of the time people end up guessing.

In our view, this kind of traditional experiment has a serious limitation: it does not take into account the influence of social interaction. On the surface, of course, no social communication is involved, as the volunteer is alone in a room. But dig deeper, and you'll find plenty. For one thing, the man hidden in the dots is a social stimulus, although not one that can interact. Such experiments involve social communication at another level, too. Any participant brings his or her baggage about what psychologists are like and how volunteers should behave.

The problem is that these hidden social interactions remain out of focus in the experiment. Our aim at the Interacting Minds project at the Danish Neuroscience Centre in Aarhus is to develop a new kind of experiment that is focused on such interactions.

In the past decade, the neuroscience of social behaviour has blossomed. A major catalyst for this has been the discovery of what seems to be a physiological mechanism for social interaction, located in the brain's "mirror neurons". These have been seen to fire not only as a monkey, say, grabs a peanut, but also when the monkey sees an experimenter do the same thing. Imaging experiments in humans have similarly revealed parts of our brains becoming active when we see someone moving, or even when watching a walker hidden among moving dots. It seems we are not just observers of the social scene but that we automatically share the experiences and emotions of the people we are observing.

This is only half the story, though, as interaction between people extends far beyond this. When I see you in pain, I feel your pain and my face automatically expresses this pain. What's more, you can see by my expression that I share your pain, and you are comforted by the knowledge someone else shares your pain. You are responding to my response to you.

Such interactions are a feature of many aspects of everyday life. They come to the fore when people play music, so in one of our experiments we got two people to tap a simple beat together. You might expect a

leader and a follower to emerge, with the leader trying to maintain the beat, while the follower synchronises with the leader. Our twist was to also study what happened when each person could only hear the other, but not him or herself. No leader emerged: both players became followers, continually and mutually adjusting their taps to each other.

How can such behaviour be explained in terms of neuroscience? We think that two people performing together in this way are best described as a single, complex system rather than as two systems interacting. We also believe the same kinds of description should be applied generally to the brain activity that occurs when two people interact, because their brains also become a single complex system.

During any kind of social interaction people unconsciously imitate each other, or else show the appropriate complementary action and reaction. When this happens, the parts of the brain that unconsciously respond to the actions of others create a form of resonance. We are not usually aware of this, but when it occurs we feel "on the same wavelength" as the person with whom we are interacting.

This feeling of similarity is an essential aspect of communication, and it is generally easier to communicate with someone who we feel is similar to ourselves because of the knowledge we share. There is, however, another important part of communication, and that is to learn new things. So, as well as bearing in mind our similarities, we must also keep track of our differences and, in particular, the things that we know and that other people don't know. Think of the appeal of gossip.

There is nothing specifically social about building models of the world. The brain does this when we are alone and unobserved, as it learns about the world and creates perceptions and beliefs. On the basis of those beliefs, our brain predicts what should happen next and decides if the sensory signals it then receives provide evidence for or against that belief. When it finds errors in its predictions, the brain acts as a hypothesis engine, continually updating our beliefs about the world. Think of the unexpected sensations when you lift a coffee pot you thought was full and it turns out to be empty.

But what makes human social interactions so fruitful in daily life - and as a subject of study - is our ability to compare our model of the world with other people's. We know something about how the brain models the world, but we need to know a great deal more about how our brains model other people's models of the world. People continuously put this kind of modelling to use when doing things with others: when we talk, teach, listen or learn. Good teachers know that and tailor their teaching accordingly. So do stage magicians as they play with our expectations and divert attention from where the trick is really happening.

We need to know how the brain models other people's models of the world

This raises the interesting question of how our brains deal with deception. Somehow, a balance has to be struck: it would be too costly to question the motive behind every interaction, but taking everything at face value makes us vulnerable. Neuroscientists have become very interested in the differences in brain activity between interacting with a person considered trustworthy and one perceived as dangerous and deceptive.

One key difference may be a shift in the balance between unconscious mirroring of another person's actions and expressions and conscious attempts to grasp the other's motives. This may lead to a decoupling from the other, a kind of separation within the interaction, as activity diminishes in areas that mirror experiences, while higher-order, cognitive frontal functions kick in.

A major aim of the Interacting Minds project is to understand the ability to compare, exchange and jointly create models of the world. Our group has forged strong collaborations with humanities departments at the University of Aarhus because we need their expertise on the shared worlds of human culture. It is these models that create the common knowledge that makes communication possible, including between experimenter and volunteer in experiments.

These shared models are often more robust and longer-lasting than the individual models. We experience them through symbols and words, which work precisely because there is general agreement about their meaning. This is how the paper and base metal we call money, for example, lets us communicate a value that can be applied to any commodity. In the right context, any object can become imbued with meaning. Just think of the collection of graphics now universally understood to indicate good humour (;-)!

The internet has dramatically increased both the possibilities for interactions and the size of the interacting groups. Undoubtedly, new shared models will emerge. But there are also greater possibilities for false models, in the shape of deception, propaganda, or genuinely held but dangerously wrong-headed ideas - creationism, the denial of global warming, take your pick. The possibility that neuroscience can help us understand the spread through society of true or false models of the world surely gives our work particular urgency.

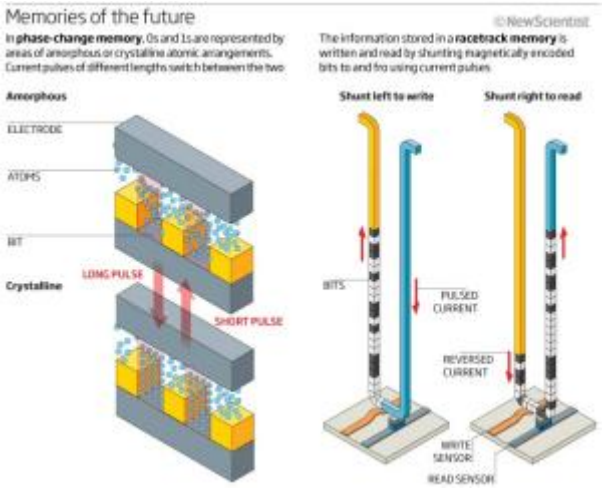
**Profile**

Andreas Roepstorff leads the Interacting Minds project at the Danish Neuroscience Centre, Aarhus. Chris Frith and Uta Frith, both based at University College London and the DNC, have been awarded the European Latsis prize for their contribution to understanding the human mind and brain

**http://www.newscientist.com/article/mg20427370.500-how-our-brains-build-social-worlds.html?DCMP=NLC-nletter&nsref=mg20427370.500**

**Five ways to revolutionise computer memory**

- 02 December 2009 by **Joerg Heber**




Memories of the future

Once upon a time, not so long ago, the idea that you might store your entire music collection on a single hand-held device would have been greeted with disbelief. Ditto backing up all your essential computer files using a memory stick key ring, or storing thousands of high-resolution holiday snaps in one pocket-sized camera.

What a difference a decade makes. The impossible has become possible thanks to the lightning rise of a memory technology with the snazzy name of "flash".

So where is the technology that can store our high-definition home cinema collection on a single chip? Or every book we would ever want to read or refer to? Flash can't do that. In labs across the world, though, an impressive array of technologies is lining up that could make such dreams achievable.

These "supermemories" are close to realising a vision set out by revered physicist Richard Feynman 50 years ago this month. In a lecture to the American Physical Society entitled "There's plenty of room at the bottom", he asked whether it might ever be possible to write all 24 volumes of the Encyclopaedia Britannica on a pin head. Each tiny ink dot used to print each letter would have to be reduced to the size of just 1000 atoms, he calculated - a square with sides of just 9 nanometres.

Feynman speculated that people looking back from the year 2000 would wonder why it took till 1960 before we began to explore this "room at the bottom" - what we now know as the nanoscale. Late start or not, the progress in miniaturising information storage in the decades since has been stunning. Today, the smallest feature that can store a bit of information is some 40 nanometres across in commercial flash devices. The first flash chips capable of storing 64 gigabits of information were shipped just a couple of months ago.

The kinds of technologies Feynman was talking about, though, would fit terabytes of data on a single chip. That requires a design simpler even than the already admirably straightforward flash architecture (see "Flash: memory hero"). The mechanism for reading and writing the memory would also have to be reliable and, above all, fast, taking just nanoseconds. And the memory should be stable: once written, it should not degrade for at least a decade.

That is quite a shopping list. Whatever technology fits the bill will not be flash, but it will be mightily impressive. It won't be easy establishing it, with flash already so well entrenched, but with the market for memory chips worth something between $20 billion and $30 billion, you can bet it won't be too long before one or more of the technologies described in this feature is sitting inside devices in our pockets. Before that happens, though, the runners and riders in the supermemory steeplechase have just a few hurdles to clear.

**MRAM**

The longest-standing pretender to flash's crown is magnetoresistive random access memory, or MRAM. Under development by several companies since the 1990s, MRAM chips store information within two thin layers of magnetic material, each divided into a grid of cells. One layer is a permanent magnet whose direction of magnetisation does not change. The other is a temporary magnet whose magnetisation can be flipped 180 degrees by applying a small magnetic field or electrical current. The relative alignment of the two layers' magnetisations determines whether a bit is set to 1 or 0 (*Science*, vol 308, p 508).

MRAM's use of magnetisation is both its strength and its weakness: its strength because magnetisation is fast and easy to control, allowing memory to be written and read in as little as a nanosecond; its weakness because changing the magnetisation of one cell tends to affect its neighbours too.

This "cross-talk" is a tough nut for MRAM researchers to crack. "They haven't really been able to solve the problem yet," says James Scott, a physicist at the University of Cambridge. At the moment it limits the size of MRAM chips to 32 megabytes, less than one-thousandth of the capacity of the best flash devices. Electronics companies such as Hitachi and Toshiba continue to work on improved designs, maintaining faith in the potential of electrically controlled MRAM for fast, high-density memory.

•Size: ?
•Speed: ok
•Stability: ok
•Power consumption: ?

**FeRAM**

Ferroelectric random access memory, or FeRAM, is a close relative of flash. Like flash, it uses electrical effects to control a transistor-like structure. But rather than controlling flows of free electrons, it takes advantage of the strange distribution of electric charges found in complex crystals known as ferroelectrics.

In a ferroelectric, small external electrical fields can induce positively and negatively charged ions in the crystal to shift in position, creating a stable electrical polarisation not unlike the field between a magnet's north and south poles. Upwards and downwards polarisations are the 0s and 1s of the ferroelectric bits (*Science*, vol 315, p 954). A small voltage applied to the crystal can be used to send in additional charges, changing the polarisation and causing the bits to flip. This process is fast - it takes less than a nanosecond in principle - and requires little power, two of the advantages of FeRAM.

As with MRAM, though, FeRAM's strength is also its Achilles' heel. "The problem is that FeRAMs are charge-based," says Rainer Waser, a physicist at RWTH Aachen University in Germany. To switch the ferroelectric with sufficient speed, the additional charge needs to be stored somewhere close by, so every FeRAM memory cell comes with a capacitor attached, eating up valuable space. "The capacitor footprint limits storage density," admits Scott, who has studied ferroelectric materials for three decades. "I can't see FeRAMs going to gigabyte devices like flash."

It could still have its uses, though: FeRAM's low power demands and straightforward design could make it the memory of choice where economy is more important than capacity. Toshiba is convinced, and announced a prototype 128 MB FeRAM chip in February 2009.

• Size: ?
• Speed: ok
• Stability: ok
•Power consumption: ok

**PCRAM**

When it comes to downsizing to the tiny scales needed to replace flash, a chameleon technology known as phase-change random access memory, or PCRAM, looks a promising bet.

It exploits the same sort of technology used in rewritable CDs and DVDs. These store information in the atomic structure of materials with two distinct solid phases: an amorphous phase similar to that in window glass, in which the atoms are arranged in no particular order, and an ordered, crystalline phase such as that found in metals. The crystalline state is electrically conducting, and the amorphous state is an insulator (*Nature Materials*, vol 6, p 824).

In PCRAM, this material is held between two electrodes. All that is needed to flip it between its two phases is a pulse of laser light or electric current applied to the electrodes to melt the material. If the current pulse is long, the material orders itself into its crystalline state. If the pulse is short, the material cools abruptly into the amorphous state (see diagram).

The approach is not without its problems. Heating memory elements to the few hundred degrees Celsius necessary to change the state dissipates a lot of power - although that power requirement will sink as the devices shrink.

With PCRAM there could be a lot of room at the bottom. Only a few atoms are needed to create a memory unit capable of distinct amorphous and crystalline states. Luping Shi of the Agency for Science, Technology and Research (A*STAR) in Singapore reckons that memory-unit sizes of just 5 nanometres across should be possible - about one-tenth the size that flash memory has so far attained.

What's more, PCRAM's switching times can be blisteringly fast. "Speeds of 1 nanosecond are feasible," says Matthias Wuttig of RWTH Aachen. The problem is that the faster a material is switched, the less stable its crystalline phase tends to be, so PCRAM speeds are still 10 to 100 times slower than that. With individual bits already being imprinted on just a few dozen atoms, the challenge now is to work out what particular combination of different atoms provides the optimal trade-off between speed and stability. Many companies are working on that, and Samsung has recently brought out a 512 MB PCRAM memory chip.

• Size: ok
• Speed: ok
• Stability: ok
•Power consumption: ?

**RRAM**

PCRAM is not alone in its potential to work at the tiniest of scales. A rival technology called resistive random access memory, or RRAM, makes that claim too. Whereas PCRAM relies on heat-induced changes in a material's atomic structure, RRAM exploits electrochemical reactions that change the bond structure of certain crystalline solids.

RRAM's raw material is a naturally insulating oxide, such as that of titanium and oxygen. When a large voltage is applied to such a crystal, the electron bonds that moor the oxygen atoms to the crystal start to break. As the oxygen floats off, it leaves behind it both holes in the crystal and excess electrons that are available for conduction.

The holes tend to be aligned in rows, creating extremely narrow, electrically conducting channels in the crystal. Reverse the voltage and the oxygen atoms move back towards the channel, cutting electrical conduction and returning the crystal to an insulating state.

This reversible transition creates stable memory states that only a high voltage of the right polarity can switch. Once this voltage is applied, just a few oxygen vacancies moving in and out of the channel are enough to toggle between conduction on and conduction off, making RRAM a fast, low-power technology (*Nature Materials*, vol 6, p 833).

"We can switch our devices in a nanosecond or less, and the energy required is in the order of a picojoule," says Stan Williams, who works on RRAM at Hewlett-Packard Laboratories in Palo Alto, California. That's about one-hundredth of the energy required by flash. And because the conducting filaments are so small, the switching process could potentially happen on a scale of just a nanometre or so, giving RRAM truly tiny potential.

We can switch our devices in a nanosecond, and the energy required is in the order of a picojoule

Stability is a growing challenge at smaller scales, though. If a high-resistance bit is set right next to a low-resistance one, electrical current tends to bypass the high-resistance region and take an undesirable detour through the neighbouring element. This is a problem that Hewlett-Packard and other companies are now trying hard to solve.

RRAM is not just exciting for its conventional memory capabilities. In 2008, Williams and his colleagues realised that RRAM devices have all the characteristics of a memristor - a fabled fourth basic electronic element to join the ranks of resistor, capacitor and inductor. Memristors differ from ordinary resistors in being able to adopt any number of values for their resistance, according to the current that flowed through them in the past. That could make them models for the analogue computational elements inside the human brain - but with a twist. "These electronic synapses are much smaller and faster than the synapses in the brain, and use less energy," says Williams.

- Size: ok
- Speed: ok
- Stability: ?
- Power consumption: ok

**Racetrack memory**

Most routes to supermemories involve finding new ways to manipulate atoms and their properties on the nanometre scale. Stuart Parkin of IBM's Almaden Research Center in San Jose, California, believes we should instead rethink memory design. "Maybe considering entirely new, three-dimensional architectures will enable us to improve memory devices further," he says. He and his IBM colleagues have got just such a suggestion: racetrack memory (*Science*, vol 320, p 190).

With racetrack memory, bits are stored as tiny domains of opposing magnetisation, rather as they are in a conventional hard drive. The difference is that the memory units, or domains, are not carved on a monolithic block, but strung out like pearls along a nanoscale magnetic wire. An electric current shunts these domains along the wire and past special reading and writing heads, where the information stored in the pattern of bits can be retrieved or modified (see diagram). This can be done at speeds of up to 200 metres per second, resulting in read times of tens of nanoseconds.

The big potential benefit of the racetrack is its storage capacity. Even just a flat micrometre-sized wire could store information with a density comparable to that of flash, says Parkin. The real deal comes, though, if the nanowires deviate from a standard two-dimensional configuration and are instead coiled into a three-dimensional arrangement of mini-skyscrapers. Then, hundreds of times more bits can be stored than in flash memory covering the same area.

So far, only two-dimensional prototypes are in development, which can match the storage density of flash. For 3D racetracks, Parkin admits his team will need a little longer. If the skyscrapers get off the ground, though, computer memory might have a very different face before too long.

• Size: ok
•Speed: ?
•Stability: ok
•Power consumption: ok

**Editorial:** *Writ small, huge recall*

**Flash: memory hero**

Conventional computer hard drives, with their mechanical arms that read information from spinning magnetic discs, are power-hungry, comparatively bulky and prone to failure. Flash memory, developed by researchers at Toshiba in Japan in 1980, is compact and demands little power. That's why it has rapidly come to dominate the market for small-scale permanent computer memories, despite its higher price tag.

Flash memory bits work in a similar way to the transistors that toggle currents in a computer's processor chips. In a transistor, a tiny electron-conducting channel is topped off by a metallic strip known as the gate. A voltage applied to the gate creates fields that determine whether electrons can flow through the transistor channel, producing controllable on and off states - the binary 1 and 0. In flash, the only difference is that the electrons are trapped at the gate by a surrounding layer of a highly insulating oxide, making the on and off states permanent.

The memory state can only be changed by applying a large voltage that allows the electrons to escape through the oxide. This makes flash drives slower than hard drives, and the passage of electrons also slowly degrades the oxide's insulating capabilities. Flash memory can be rewritten only so often - generally between 10,000 and 100,000 times - before failing.

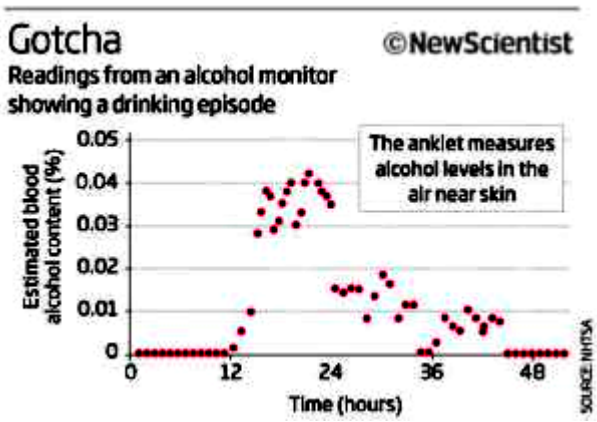
Flash's main limitation is storage density, however. The best flash chips currently have a storage density comparable to that of magnetic hard drives, but in both cases significant further miniaturisation will be difficult. For flash, quantum effects such as electron tunnelling will make the memory patchy if the bit-storage size dips below about 20 nanometres.

*Joerg Heber is an editor at Nature Materials*

**http://www.newscientist.com/article/mg20427370.600-five-ways-to-revolutionise-computer-memory.html?DCMP=NLC-nletter&nsref=mg20427370.600**

**The electronic fink that will squeal if you drink**

- 02 December 2009 by **Jim Giles**
- Magazine issue 2737.




MEMORIAL day weekend 2007 is one that Lindsay Lohan might rather forget. An actor better known for her off-screen antics than her starring roles, Lohan crashed her Mercedes in Santa Monica, California, while over the legal alcohol limit. She checked into rehab. A month-and-a-half later, in July, Lohan emerged and declared that she would clean up her act. Within days she was again caught driving while over the limit.

This celebrity story has a twist, however. As part of her efforts to stay sober, Lohan wore an alcohol-monitoring anklet. When photos of her wearing the anklet hit the press, it was the first time many people had heard of such a thing. Yet devices like these are transforming the way alcohol offenders are dealt with in the US.

"In the past we've said that if you don't stop drinking and driving, we'll stop you from driving," says Bill Mickelson, who has worked with the devices as part of a sobriety programme in South Dakota. "That never got to the heart of the problem. So we've developed a way to stop you drinking."

Stopping drink-drivers from driving didn't always work. Now we have a way to stop them drinking

Lohan wore her anklet voluntarily, but most wearers have no choice if they wish to avoid jail. So in the not-too-distant future, could you find yourself wearing such a device if you misbehave after having a few too many? Is this the first step towards a Big Brother age even more intrusive than that envisaged by George Orwell, where the authorities are automatically alerted whenever you consume any substance deemed undesirable? And is this kind of monitoring reliable?

Traces of most drugs linger in our bodies for days or weeks, so random tests every few days can detect most use. Alcohol, however, leaves the body so quickly that tests would have to be done more than once a day to be sure of detecting any drinking. Hence the need for the device Lohan wore, called a secure continuous remote alcohol monitor, or SCRAM.

It relies on the fact that about 1 per cent of any alcohol we consume leaves the body through the skin. Once an hour, it fires a soft jet of air at the skin, vaporising any alcohol present and measuring its concentration. Every night, the day's readings are relayed to the company that makes the anklets, Alcohol Monitoring Systems of Littleton, Colorado, via a modem installed in the wearer's home. If it appears that an individual has been drinking, AMS notifies the relevant official.

Over the past six years, use of the anklets has spread to almost every part of the US. The courts there have the power to place someone convicted of drunk-driving or alcohol-related violence on probation and require that they abstain from drinking, rather than send them to jail. Judges can also make SCRAM use a condition of bail.

Wearing a monitor is a small price to pay for being able to stay at home with your family and go to work as usual, rather than go to jail. It is also cheaper: SCRAM costs about $12 per person per day, compared with about $60 to keep someone locked up.

These advantages have led to the rapid adoption of SCRAM across the US since its introduction in 2003: over 110,000 people have worn the anklets and about 10,000 are currently being monitored.

Some wearers try to beat the system by placing a barrier between the anklet and their skin, or by removing it altogether, but tampering can be detected. The monitor is fitted with an infrared sensor whose readings change abruptly if objects are placed underneath it, while a temperature sensor triggers an alert if it appears the anklet has been removed from the skin.

Wearers often complain that the device is uncomfortable and looks embarrassing. But beyond that the ankle monitors do not cause any serious problems, says AMS spokesperson Kathleen Brown. They can be worn in the bath and while running or driving, though they can interfere with sports such as soccer.

AMS says that over 70 per cent of SCRAM users do not violate the terms of their probation or bail, which suggests that the device is helping to reduce drinking and by extension alcohol-related crimes. No rigorous, randomised trials have been carried out to confirm this, but what evidence there is appears positive. In 2005, for instance, South Dakota launched its 24/7 sobriety programme, under which judges can order offenders or those on bail not to drink or take drugs. While other states have similar programmes, South Dakota broke new ground by forcing those on the scheme to submit to round-the-clock monitoring using, among others, SCRAM, breath and urine tests. Although it is not possible to separate the effect of SCRAM from the other forms of testing used, the overall impact has been impressive: alcohol-related accidents and injuries have fallen by 43 per cent in the state over the last three years.

**False positives**

Amid the chorus of approval, however, there are a few dissenting voices. Ever since the anklet was introduced, a few wearers have claimed that the device produces false positives: alerts for drinking sessions that never happened.

The SCRAM's sensor detects the pair of oxygen and hydrogen atoms, called a hydroxyl group, characteristic of all alcohols. This means it cannot discriminate between ethanol and other forms of alcohol. Many common household substances, such as cleaning fluids and perfume, contain alcohol, which can get into the gap between the detector and skin to produce a false reading.

AMS, however, insists that it can differentiate between external contamination and drinking. Suspicious readings are automatically flagged up by computer at the AMS offices. The company's customer service team takes a look and, if the readings seem ambiguous, sends them to Jeffrey Hawthorne, co-founder of AMS, and a colleague of his for confirmation. Hawthorne would not tell *New Scientist* exactly how they make that call, but says the process is based on the fact that external contaminants, such as perfume, build up on and evaporate from the skin more rapidly than ethanol from drinking.

When someone wearing a SCRAM starts drinking, Hawthorne says, the estimated blood alcohol concentration readings will rise by less than 0.05 percentage points per hour (see graph). When the wearer stops drinking, readings fall at less than 0.025 percentage points per hour. More rapid changes must be due to a contaminant, he claims.

Paige Lustig is just one of several people to disagree. One morning in February 2006, Lustig arrived for a modelling assignment at a hair salon in Birmingham, Alabama. She was on probation for drunk-driving and was wearing a SCRAM. Just after 1 pm, when she left the salon to go home, the device recorded a build-up of alcohol. Lustig found herself back in court facing a jail term.

Alcohol does not appear on the skin until 1 to 2 hours after consumption begins, so the readings suggested that Lustig started drinking in the middle of her modelling job. Lustig insists this did not happen. Salvatore Rino Marra, the salon's owner, told the probation hearing that he never allows alcohol in his salon. His wife, and one of the other stylists present that morning, also said that Lustig had not been drinking.

Marra and his wife had applied shampoo, gel, conditioner and large amounts of hair spray to Lustig's hair, compounds that often contain alcohol. Lustig's hair was also blown dry. It is possible that the air in the salon that morning contained enough alcohol to trigger the SCRAM, Michael Hlastala, an expert in the physiology of alcohol at the University of Washington in Seattle, told the court.

Hlastala is a critic of the SCRAM and has testified in around a dozen cases involving the device. He accepts that contaminants generally build up and decay more rapidly than alcohol from drinking, but claims SCRAM data is often so noisy that it is not always possible to distinguish between the two. "It's very hard to identify curves caused by these chemicals," he warns.

Lustig's probation violation was dismissed by the judge, largely on the basis of the eyewitness accounts. AMS would not comment on the case, but the company acknowledges that mistakes are possible, if rare. Brown says that AMS runs internal monthly tests using at least 10 volunteers. Each wears a SCRAM anklet and keeps a log of their activities, including drinking. "We recruit people from hair salons, auto shops, construction sites, bars," she says. Over 12 years of testing, the false positive rate is running at 0.12 per cent. This figure suggests about 1 in 800 of the alerts issued to authorities by AMS is incorrect.

There is little independent research on the SCRAM, but what there is does not contradict AMS's internal findings. In one study, Paul Marques and Scott McKnight of the Pacific Institute for Research and Evaluation in Calverton, Maryland, checked the readings produced when 22 volunteers wearing SCRAMs drank, both in the lab and at home and in bars, over two to four weeks. The device detected 88 per cent of drinking episodes that raised blood-alcohol concentrations above 0.08 per cent - the limit for driving in many countries including the US and UK - with zero false positives (*Alcoholism: Clinical and Experimental Research*, vol 33, p 703).

Despite the small size of the study, its results have been used with great success to defend against court challenges to the SCRAM. Only a handful of alerts appear to have been overturned in court, *New Scientist*'s research suggests, despite the fact that at least several tens of alerts must have been false positives.

**Second opinion**

Marques thinks AMS should notify SCRAM wearers immediately if a positive result is registered. That way, anyone who thinks the alert is a false positive might have time to take a breath or urine test. "If it's going to affect someone's freedom then we need confirmation," Marques says. In practice this could be difficult, as readings can only be sent to AMS when people are within range of the modem in their home. AMS, for its part, says it is up to the courts to decide if people should have the right to a back-up test.

For now, the company is focusing on the US market, and *New Scientist* found that few officials in other countries knew much about its alcohol monitors. The UK's Department of Transport says it has not looked at this kind of device, for instance. Introducing them could be tricky in many countries, because few have the legal power to stop people drinking altogether. In Australia, for instance, offenders can be banned from entering bars but not from drinking elsewhere.

Future monitors, however, could make it possible to detect more specific activities, such as driving while under the influence. L3 Communications of Canton, Massachusetts, has developed an anklet that can detect the characteristic patterns of acceleration and deceleration generated by the motion of a car, and the movement of a driver's foot on and off the pedals.

The anklet identified when people were driving with 100 per cent accuracy during internal testing, says Leroy Collins, a member of the development team. L3 designed the device for use with people who have had their driving licence suspended, but several companies are now developing rival alcohol monitors after AMS's success and some are interested in incorporating L3's technology.

Some people will think that this kind of monitoring is a step too far. But as long as it helps keep people off drink or off the road, and out of jail, it is likely to attract more supporters than critics. Even researchers concerned about the lack of rigorous, large-scale studies say the benefits of AMS's device justify its use. "I'm sceptical about the science," says Arthur Lurigio, who studies criminal justice and health at Loyola University in Chicago. "But I welcome the SCRAM because it helps people avoid jail and the stigma of jail."

**How wrong is too wrong?**

In the film *Minority Report*, a rather implausible method of preventing murders is abandoned as soon as it is shown it occasionally lands innocent people in jail. Real life is very different.

In the US, as in the UK, prosecutors have to prove that evidence of guilt is "beyond reasonable doubt". This standard is rarely quantified, but legal scholars have debated it and judges in the US have been surveyed on the issue. Most put the figure at between 85 and 95 per cent likelihood of guilt. For US probation hearings, the standard is much lower: they usually operate on a standard of "preponderance of the evidence", or greater than 50 per cent.For these reasons, courts are happy to rely on monitoring devices and tests - even when they are not very accurate. People want complete accuracy, says Leo Kadehjian, a biomedical consultant based in Palo Alto, California, who has advised judges on drug-testing technology. "But that's not what we're entitled to under the constitution," he says. "We have to accept that some guilty people will go free and that some innocent people will be convicted."

**We are monitoring you**

Electronic monitoring of offenders was pioneered in the US in the 1980s by a judge inspired by a Spider-Man comic. The first generation of tags, designed to enforce house arrests or curfews, simply reveal if someone is in the range of a base station. Now companies are starting to produce far more sophisticated devices, such as alcohol monitors.GPS-based monitors are already being used to track people 24 hours a day and sound an alarm if they approach areas from which they have been banned. Next up will be devices containing accelerometers, which can reveal what people are doing, such as driving (see main story).

If these prove successful, companies could produce monitors that record far more, from heart rate and muscle movement to sound and video, to reveal exactly what people are up to. Inventors have even patented devices that would make it possible to apply electric shocks or immobilise wearers from afar.A few people already choose to have RFID chips implanted to allow them to be identified by doctors or help locate them if kidnapped, and enforced implantation in prisoners and mentally impaired people has been considered. Some companies are trying to develop GPS-capable implants, as well as implantable insulin sensors, which might one day be adapted to monitor such things as drug use or stress hormones. More sophisticated implants will require better power sources than currently exist, however.

**Michael Le Page**

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**http://www.newscientist.com/article/mg20427370.700-the-electronic-fink-that-will-squeal-if-you-drink.html?DCMP=NLC-nletter&nsref=mg20427370.700**

**Homosexual selection: The power of same-sex liaisons**

- 02 December 2009 by **Kate Douglas**
- Magazine issue 2737.


Explicable liaisons

Enlarge image

**Editorial:** *Homosexuality in nature is no guide to morality*

NOT long ago, the news was full of reports about two male Humboldt penguins at a zoo in Germany that adopted an egg, hatched it and reared the chick together. It seems like every time you turn around, the media spotlight has fallen on another example of same-sex liaisons in the animal kingdom.

In the past few years, the ubiquity of such behaviour has become apparent. This summer evolutionary biologists Marlene Zuk and Nathan Bailey from the University of California, Riverside, published a paper on the subject that included examples from dozens of species ranging from dung flies and woodpeckers to bison and macaques.

That is just the beginning of the story. The burning question is why same-sex behaviour would evolve at all when it runs counter to evolutionary principles. But does it? In fact there are many good reasons for same-sex sexual behaviour. What's more, Zuk and Bailey suggest that in a species where it is common, it is an important driving force in evolution.

Although terms such as homosexual, gay and transgender are commonly used by the mass media, and even by some ethologists, Bailey and Zuk believe you shouldn't extend these descriptors of human sexuality to animals. "It's not simply that they are burdened with the weight of social, moral and political implications, which can obscure objective scientific study," says Bailey. "The problem is that while we can observe the sexual behaviour of animals, we often have little inkling about what motivates it." Besides, as far as we know animals do not form sexual self-identities in the way humans do, he adds. That is why he and Zuk prefer to use the more objective term "same-sex sexual behaviour", which they define as behaviours found in two animals of the same sex that you would find in opposite-sex pairs during courtship, copulation or parenting.

Same-sex behaviour is not necessarily synonymous with same-sex preferences, which have been observed in only a handful of animals. In 2005, for example, Hans Van Gossum from the University of Antwerp in Belgium and colleagues found that damselflies kept in all-male groups subsequently preferred to court

other males rather than females, though this preference could be reversed simply by housing them with females (*Biological Letters*, vol 1, p 268).

Neither can you necessarily infer anything about sexual orientation from same-sex behaviour. Orientation is tricky to establish because it requires information about the consistency of partner preferences over a long period of time. Examples are thin on the ground, either because they do not exist or because they have yet to be discovered. The most notable include some male bighorn sheep that have been observed to predominantly mount other males throughout their lives, and female Laysan albatrosses - more of which later.

Nevertheless, even narrowing the scope to sexual behaviours rather than preferences or orientation leaves a huge evolutionary puzzle. Why would individuals expend time and energy in activities that fail to increase reproductive success? Could the sheer numbers engaging in same-sex behaviour mean that it has survival benefits after all?

Why expend time and energy in activities that fail to increase reproductive success?

In 2008, Sara Lewis at Tufts University in Medford, Massachusetts, and colleagues decided to address this question (*Journal of Evolutionary Biology*, vol 22, p 60). Red flour beetles are a scourge of the pantry, but they are up to more in there than just infesting your food. Sexually receptive females locate males by homing in on airborne pheromones released by the males, but these same signals also occasionally attract other males. The mounting male clambers on top of his quarry and extrudes his genitals, sometimes transferring sperm to the hind end of his partner. Might these male-male copulations provide some benefit to the participants? The researchers designed an experiment to test three possibilities: that males establish social dominance by mounting other males, that males who mount other males gain practice for later sexual encounters with females, and finally, that mounting males transfer sperm onto the other males, who then inadvertently inseminate a female with it later on. Only this last idea stood up: they found that a small proportion of offspring were fathered by males who had never mated with the mothers but had mounted another male that had subsequently copulated with the female.

Other research groups have tested the evolutionary underpinnings of same-sex behaviour in different species and come up with a variety of explanations. Zuk and Bailey were intrigued by the idea that there might be common factors in these various theories. Their paper brings all the evidence together for the first time and concludes that there are many evolutionary origins of same-sex sexual behaviour (*Trends in Evolution and Ecology*, vol 24, p 439).

First, there are the adaptive hypotheses, which provide an explanation for same-sex behaviour that would boost the biological fitness of one or more of the individuals involved (see chart). For example, several species, including bottlenose dolphins, seem to use same-sex behaviours to promote social bonding. Others may have evolved them as a form of intrasexual conflict. Indirect insemination, as in the flour beetle, provides a third possible adaptive advantage. Then there is the practice hypothesis, that individuals are honing their skills for mating, which seems to hold good for male fruit flies at least.

Several other adaptive explanations have been invoked to explain same-sex behaviour in humans, including kin selection - helping to further the genes you share with close family members - and "over-dominance" - the idea that certain genes somehow increase fitness in individuals who possess a single copy of them but are associated with same-sex behaviour in people with two copies. Then there is "sexually antagonistic selection" - the idea that alleles promoting same-sex behaviour in men are favoured by selection because they increase the reproductive chances of their daughters.

There are also various non-adaptive explanations. Mistaken identity could indeed be one cause. Van Gossum's damselflies exemplify another idea, known as the prisoner effect, in which depriving individuals of interaction with the opposite sex prompts them to mate with members of their own sex. Then there is the evolutionary by-product hypothesis - selection for some other independent trait, such as

high sexual responsiveness, might make individuals more likely to participate in same-sex sexual behaviour. It has also been suggested that same-sex behaviours appear when organisms are imperfectly adapted to their environment.

Even without further investigation of these hypotheses there is enough evidence to conclude that same-sex sexual behaviour has a wide variety of origins. Zuk and Bailey were also struck by the idea that evolutionary biologists have been missing an important piece of the puzzle. Regardless of why same-sex behaviour exists, if it is common enough, it is likely to affect social interactions within a population, change the behaviour of other individuals, and even nudge the evolution of other traits in a different direction. "Researchers have not studied the evolutionary consequences of same-sex behaviour, but we found some tantalising examples that suggest it might be worthwhile to do so," says Bailey.

Evolutionary biologists have been missing an important piece of the puzzle

Take the desert locust, famous for forming dense, apocalyptic swarms. In the midst of this orgiastic chaos, males are sometimes mounted by other males, and so miss the opportunity to copulate with females or simply to feed. However, they can minimise the chances of this happening by releasing large amounts of a pheromone called phenylacetonitrile. The mere possibility of same-sex sexual behaviour, for whatever reason, might have favoured the evolution of males that release lots of phenylacetonitrile at just the right moment to ward off other males and prevent same-sex mounting.

Then there is the example of the common toad. A male toad has to be persuasive to get a female to mate with him - in fact, he has to squeeze the eggs right out of her before he can fertilise them. Males accomplish this feat by embracing the object of their affection in a tight mating "hug" called amplexus. They are evidently not very good at telling females apart from males since they sometimes mistakenly climb onto other males. When this happens, the hapless victim pipes up with a special chirp, only used in this context, which prompts the clasping male to release his vice-like grip. "It would be worth investigating further whether this special 'get off me' chirp owes its existence to the presence of same-sex mounting in this species," says Bailey.

Here are two small examples of physical traits that may have been shaped by same-sex behaviour. If Bailey and Zuk are correct, this could be the tip of the iceberg. They point out that in theory, there are many ways in which same-sex sexual behaviour could affect the evolutionary trajectory of a species. By definition it alters the social environment of a population of animals. Since an individual's social environment affects its success in terms of survival and reproduction, you might expect such changes to influence the speed or direction of evolutionary change.

Take the Laysan albatross. These large, graceful seabirds establish breeding colonies on islands in the Hawaiian archipelago, and recently it emerged that in the Oahu colony over 30 per cent of the nesting pairs consist of two females. Female-female pairings have been observed in other birds, such as California gulls and roseate terns, but never at quite such a high rate. What's more, Lindsay Young from the University of Hawaii found that many of the albatross female-female pairs remain faithful over several years. They engage in mutual preening and even occasionally copulation, and, like female-male pairs, each year they raise a single chick. Both females will have laid a fertilised egg and randomly shunted one aside (*Biology Letters*, vol 4, p 323).

**Changing evolution**

The fact that female same-sex bonds accounted for nearly a third of the breeding pairs in the Oahu colony makes for interesting population dynamics, according to Bailey and Zuk, and it prompts the question of what evolutionary consequences the colony might experience as a result. For instance, in colonies where females without a mate remain single, the male gains little by straying from his female partner. Even if he did fertilise the egg of a non-paired female it would not survive as it takes two adults to raise a single chick. In the Oahu colony, though, males that mate with females outside their long-term pair bond might

gain an edge over those that do not. "So one evolutionary consequence to keep an eye out for in Laysan albatross populations that have high rates of female-female pairs is the evolution of males that spend more time copulating with females to whom they are not permanently bonded," says Bailey.

From the female perspective there are possible evolutionary consequences too. Consider the procedure for deciding which of the two eggs in a female-female partnership is incubated. It appears to be random: in a population with only opposite-sex pairs, females never need to distinguish their own eggs, so the ability to do so is unlikely to have evolved. But imagine if a genetic mutation arose in one member of a female-female pair that enabled her to distinguish her egg from that laid by her partner, says Bailey. "The mutation would probably spread through the population and tip the dynamics of female-female relationships more towards conflict rather than cooperation."

All this is hypothetical since same-sex behaviour has not been studied from this angle before. Nevertheless, there is no doubt that the prevalence of female-female pairs in the Oahu colony changes the costs and benefits of traits such as extra-pair copulations for males and egg recognition for females. What's more, Bailey points out that the evolutionary consequences might reverberate way beyond this colony. That is because the excess of females in Oahu is a consequence of females having migrated in from elsewhere. By adopting same-sex parenting behaviour, female Laysan albatrosses could escape colonies with dwindling resources and reproduce even when the sex ratio in their adoptive colony is biased against them.

Whether or not same-sex behaviour is an important factor in evolution remains to be seen. "Given its persistence in species in many different animal groups, including humans, viewing it as an evolutionary force in its own right promises to provide a much richer understanding of the evolution of reproductive behaviour," Bailey says. He suggests we could make some fascinating comparisons. Might male-male copulation in species as diverse as flour beetles and dolphins have similar, even predictable, evolutionary consequences? More daringly, could understanding the evolutionary consequences of same-sex interactions in animals help us understand our own evolution?

*Kate Douglas is a feature editor at New Scientist*

**http://www.newscientist.com/article/mg20427370.800-homosexual-selection-the-power-of-samesex-liaisons.html?DCMP=NLC-nletter&nsref=mg20427370.800**

**Personalised vaccines could protect all children**

- 02 December 2009 by **Charlotte King**
- Magazine issue 2737. **Subscribe** and get 4 free issues.

CHILDREN whose genetic make-up means they may not be protected by the standard form of a vaccine could in future be given a personalised shot. This is the prospect raised by the discovery of gene variants that seem to predict whether an individual will produce enough antibodies in response to a vaccine to protect them against disease.

Vaccines expose the immune system to a deactivated version of a disease agent. This prompts the production of specific antibodies, which will bind to the real disease-causing agent if the vaccinated person is later exposed to it. Though all of us usually get the same vaccines in the same doses, not everyone produces enough disease-specific antibodies in response. As a result, between 5 and 20 per cent of people vaccinated against hepatitis B, and between 2 and 10 per cent of those vaccinated against measles, will not be protected if they ever encounter these viruses.

Various factors determine who goes unprotected, but it is clear that genes play a major role. Finding out which gene variants lead to an abnormally weak vaccine response could allow people with these variants to be given alternative immunisations. These might take the form of higher doses of the standard vaccine, or a modified version of it.

To work out which genes help determine the immune response to common childhood vaccines, Berran Yucesoy of the US National Institute for Occupational Safety and Health in Morgantown, West Virginia, and her colleagues focused on genes that code for cytokines. These cell-signalling molecules help to produce antibodies and recruit infection-fighting cells.

Yucesoy's team analysed the DNA of 141 healthy babies aged between 11.5 and 14 months, searching for variations in 11 cytokine genes. They then gave the babies routine vaccines for hepatitis B and pneumococcus and a standard diphtheria-tetanus-whooping cough combination vaccine, and measured the levels of antibodies in their blood.

When the team analysed their results, they found single-letter variations in seven of the cytokine genes that were more common in infants who produced low levels of antibodies in response to certain vaccines. Most variants were associated with antibodies to just one disease, although in one case, the same variant was associated with fewer antibodies to tetanus and more to pneumococcus (*Vaccine*, DOI: 1016/j.vaccine.2009.09.076).

The researchers still have to confirm their results in a larger population of children, and to demonstrate that these gene variants translate into a lack of disease protection. But if the results stand up, infants' genes could be routinely screened for these variants before vaccination. If a child has some of the variants, the missing cytokines could be added to the vaccine formulation. Another option would be to add immune stimulants or give a higher dose of vaccine, to increase the response from the intact cytokine genes.

"Although the findings of the paper need confirming, it is possible that, in future, knowledge of an individual's genetic background might allow doctors to use vaccinations especially designed to get the optimum response for someone with that particular genetic background," says Hilary Longhurst, an immunologist at St Bartholomew's Hospital in London.

An individual's genes might allow doctors to design vaccines that get the optimum response

**http://www.newscientist.com/article/mg20427373.500-personalised-vaccines-could-protect-all-children.html?DCMP=NLC-nletter&nsref=mg20427373.500**

**Glue injections help sick babies**

**Children suffering from a rare condition which can kill babies within days are being saved - with glue.**

The adhesive is being given injected to combat Vein of Galen malformation, which affects communication between the arteries and veins in their brain.

Dafi Evans, of Talgarreg, Ceredigion, is one of the toddlers treated at Great Ormond Street Hospital in London and his mother called it "truly amazing".

Dr Stefan Brew has operated on 50 children with Vein of Galen since 2003.

The condition puts a strain on the heart and babies usually die within three or four days as a result of heart failure or water on the brain.

" **It's been a rollercoaster year but he's well and doing everything that he should** "
Catrin Evans, mother

But by injecting the tissue adhesive Histoacryl through a catheter into the baby's groin, the affected area of the brain is blocked.

Dafi's mother Catrin was heavily pregnant when she and husband Eilir were told their unborn baby had the life-threatening condition.

**"Very lucky"**

But after a "rollercoaster year", 16-month-old Dafi is healthy and as full of energy as any other toddler.

Mrs Evans, 32, said she feels "very lucky" that staff at Bronglais Hosptal in Aberystwyth spotted something was wrong during a routine scan at 36 weeks.

The couple was sent to the Elizabeth Garrett Anderson Hospital in central London, where Vein of Galen malformation was diagnosed.

Dafi was delivered by caesarean section and immediately whisked off to GOSH for treatment by Dr Stefan Brew, who has operated on about 50 children with Vein of Galen.

When Dafi was just a day old, glue was squeezed into the affected part of his brain through a catheter, plugging the leak.

**First birthday**

Dafi improved straight away and was able to go home but a check in Cardiff two months later detected a second leak, so Dr Brew performed the procedure for a second time.

Dafi had his fifth operation on his first birthday and expects a sixth next month.

"It's been a rollercoaster year but he's well and doing everything that he should; developing as he should," said Mrs Evans.

"It's great. It's unbelievable. He truly is fantastic, full of energy. He's exactly like his sister."

Former headteacher Mrs Evans added: "I couldn't believe how simple an operation it looks; it's so non-invasive.

"It's so dangerous but he comes back looking perfect - no scars, just a tiny cut."

**Stressful procedure**

Consultant interventional neuro radiologist Dr Brew described carrying out the highly skilled procedure as "incredibly stressful" but satisfying.

"The children go from looking like they were about to die, often overnight, to looking very well," he said.

About 60% of children treated with the injections go on to live a normal life while about 20% are left with only a mild disability.

Ten per cent are left severely disabled and one in 10 children die.

"No matter how careful you are, there's an element of chance to it," Dr Brew. "What is known is that if you don't treat them, they die."

The glue technique was pioneered by Dr Pierre Lasjaunias in France in the 1980s.

Dr Brew has been performing the glue treatment since 2003.

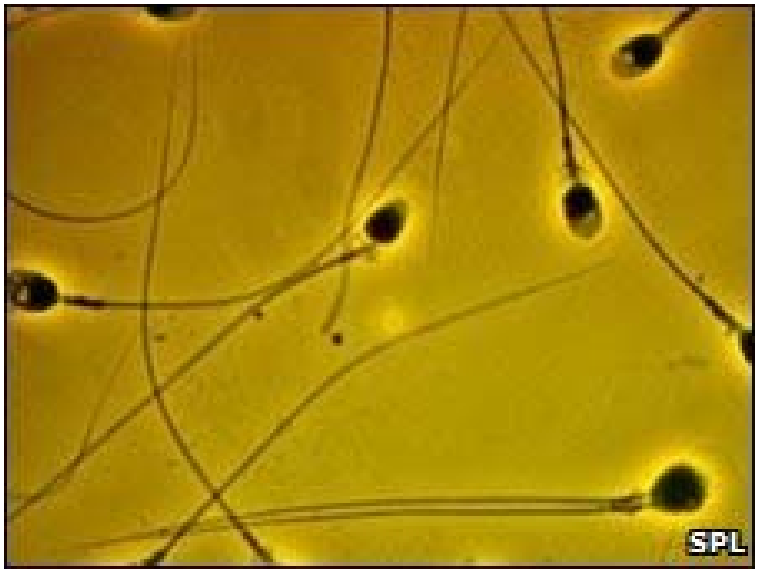
Mrs Evans added: "The work Dr Brew's done is totally amazing. It's truly amazing."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/wales/8390262.stm

Published: 2009/12/02 12:18:04 GMT

**Men's genes 'may limit lifespan'**

**Men carry the seeds of their own destruction in the genes present in their sperm, research suggests.**




Scientists working on mice have highlighted a specific gene that, although carried by both sexes, appears to be active only in males.

They believe it allows males to grow bigger bodies - but at the expense of their longevity.

The study, by Tokyo University of Agriculture, appears in the journal Human Reproduction.

" **These are interesting findings but any sex differences in longevity may have more complex explanations than any single gene** "
Professor Kay-Tee Khaw University of Cambridge

Although the study was conducted on mice, the researchers believe it could apply to all mammals - including humans.

They studied mice created with genetic material from two mothers, but no father.

This was achieved by manipulating DNA in mouse eggs so the genes behaved like those in sperm.

The altered genetic material was implanted into the eggs of adult female mice to create embryos.

The resulting offspring, completely free of any genetic material inherited from a male, lived on average a third longer than mice with a normal genetic inheritance.

**Better immune function**

The mice with two mothers were significantly lighter and smaller at birth.

But they appeared to have better functioning immune systems.

The researchers believe the key is a gene passed on by fathers called Rasgrf1.

Although it passes down to both sexes, it is silenced in females through a process known as imprinting.

Lead researcher Professor Tomohiro Kono said: "We have known for some time that women tend to live longer than men in almost all countries worldwide, and that these sex-related differences in longevity also occur in many other mammalian species.

"However, the reason for this difference was unclear and, in particular, it was not known whether longevity in mammals was controlled by the genome composition of only one or both parents.

"Our results suggested sex differences in longevity originating at the genome level, implying that the sperm genome has a detrimental effect on longevity in mammals.

"The study may give an answer to the fundamental questions: that is, whether longevity in mammals is controlled by the genome composition of only one or both parents, and just maybe, why women are at an advantage over men with regard to lifespan."

In the UK the average lifespan for men is 77.4 and for women 81.6.

The researchers said in nature males tended to concentrate resources on building a large body, because strength and bulk help them fight for mating opportunities with females.

In contrast, females tended to conserve energy for breeding and providing for their offspring.

Dr Allan Pacey, an expert in reproduction at the University of Sheffield, said: "The results of this study are intriguing, and this is a topic that clearly needs further investigation.

"However, I would resist the temptation to fantasise about whether this may one day to a medical treatment to extend life through gene manipulation.

"I think humans have a good innings on the whole and we should try and be content with that."

Professor Kay-Tee Khaw, an expert in ageing at the University of Cambridge, said the findings were not necessarily applicable to humans.

She said: "These are interesting findings but I think any sex differences in longevity - which in humans have changed over time and differ in different environments - may have more complex explanations than any single gene."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8390055.stm

Published: 2009/12/02 10:42:27 GMT

**US approves 'ethical' stem cells**

**US regulators have approved 13 new lines of human embryonic stem cells for use in scientific research.**


They are the first batches of embryonic stem cells - the building blocks of the body - that have been made available to US researchers in almost a decade.

The move comes after President Barack Obama eased restrictions on federally funded embryonic stem cell research.

Another 96 lines could soon be approved if they meet the ethical guidelines unveiled in July, US scientists said.

Scientists hope to harness the cells to treat a variety of diseases, including injuries, cancer and diabetes.

**Ethical tests**

"I am happy to say that we now have human embryonic stem cell lines eligible for use by our research community under our new stem cell policy," said Francis Collins, director of the US National Institutes of Health.

Embryonic stem cells come from days-old embryos and can morph into any type of cell in the body.

Each embryo yields one stem cell line - a family of cells which can be replicated indefinitely in a laboratory.

But their use in scientific research is controversial. Opponents say culling the cells is unethical, as it destroys the human embryo.

Under former President George W Bush, federal funding was limited to about 60 stem cell lines created from embryos destroyed prior to August 2001.

Scientists say the new lines were created in ways that made them far better candidates for successful research.

The US government unveiled ethical guidelines for the research in July, requiring full parental consent and limiting scientists to using existing embryos that would otherwise be destroyed.

In keeping with the guidelines, the 13 newly-approved lines were created using private money from leftover embryos at fertility clinics.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8391924.stm

Published: 2009/12/02 22:23:14 GMT

**Pandas 'chirp' to get pregnant**
By Jody Bourton
Earth News reporter

**For female giant pandas who can only conceive on a few days once a year, being able to say "when" is vital.**


Now a report reveals that female giant pandas use chirp calls to inform male pandas exactly how fertile they are.

The discovery suggests that panda vocal signals are more important than thought, and will aid conservation of the endangered animal, scientists say.

The researchers from the US and China publish their research in the journal Proceedings of the Royal Society B.

During their short breeding season, female giant pandas ( *Ailuropoda melanoleuca* ) make high pitched calls that are thought to solicit male attention.

**It gives us a better understanding of this critically endangered species's reproductive behaviour**
Dr Ben Charlton Zoo Atlanta, Georgia, US

Given the brief window of opportunity for mating, selection should favour female giant pandas who are able to advertise their fertility and for males who accurately read the female calls.

However, the information content and detailed function of the 'chirp' and 'bleat' vocalisations has remained a mystery.

To investigate, the research team recorded vocalisations of captive giant pandas in China and the US.

Using these audio recordings and a knowledge of individuals' reproductive cycles, they reveal that panda calls signal the precise timing of female fertility.

Chirp calls were observed to differ depending on whether they were in a pre-fertile or fertile stage of the reproductive cycle.

Female giant pandas in a fertile stage would give longer calls that were characterised by a higher jitter and harshness, the researchers write.

The increased harshness of the chirps could indicate greater arousal levels, they say.

By playing recorded female vocalisations to male giant pandas, the researchers also found that males use calls to preferentially mate with females who signal they are at the optimum time for mating.

**Female voice**

This is the first experimental evidence to show that giant panda vocalisations can signal a female's exact fertile phase, says Dr Benjamin Charlton from Zoo Atlanta, Georgia in the US, who led the research team.

He completed the research along with researchers from San Diego Zoo's Institute for Conservation Research in the US and the China Research and Conservation Centre for the Giant Panda, Sichuan Province, China.

"Several nonhuman mammal studies have shown that female vocal behaviour can advertise fertility," Dr Charlton says.

And it is not just in the animal world this may occur.

"Recent work on humans has shown that that female vocalisations varies significantly around their fertile period," Dr Charlton says.

He explains that rising oestrogen levels around the time of ovulation in females has been suggested to change vocal structures and vocalisation. With the knowledge that other species, perhaps including our own, use sounds to signal fertility, he not surprised to find that pandas do similar.

**Fertility clinic**

"I was excited to find acoustic cues to female fertility in giant pandas because it gives us a better understanding of this critically endangered species's reproductive behaviour," Dr Charlton says.

Research on communication and reproductive behaviour has been instrumental in recent improvements in conservation and breeding programmes for giant pandas.

The researchers hope this study will provide valuable information that will help the long term future of one of nature's most secretive and charismatic animals. "By identifying key aspects of reproductive behaviour in giant pandas we can hope to provide the ideal environments and stimuli required for them to reproduce", Dr Charlton says.

"In doing so we can increase the success of captive breeding programmes."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/earth/hi/earth_news/newsid_8388000/8388484.stm

Published: 2009/12/02 12:46:59 GMT

**Fund family planning 'to cut CO2'**

**Meeting the demand for family planning in poor nations is a cheap and effective way to cut CO2 emissions, a new website initiative claims.**


The UK-based Optimum Population Trust says fast-rising population levels lead to growing emissions.

The website is urging wealthy people to offset their own CO2 emissions by funding contraception programmes.

It says taking such action is better value than spending money on wind turbines, solar power or hybrid cars.

Critics would argue the analysis is too simplistic, a BBC correspondent says.

The BBC's environment analyst Roger Harrabin says they could contend that reducing the number of people born in the US would make a big difference in achieving reductions in CO2 levels.

Our correspondent added that carbon emissions from people in much of sub-Saharan Africa are so low that they can barely be counted.

According to the OPT, every £4 spent on family planning saves one tonne of CO2.

It estimates that a similar reduction would require an £8 investment in tree planting, £15 in wind power, £31 in solar energy and £56 in hybrid vehicle technology.

It is promoting a scheme in which wealthy people can offset their own carbon emissions by funding contraceptive programmes in the developing world.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8392193.stm

Published: 2009/12/03 01:56:13 GMT

**The Dangerous Mysteries of ConsciousnessWe still need answers.**

*By Ron Rosenbaum*Posted Monday, Nov. 30, 2009, at 6:10 PM ET

There's a certain kind of mystery—unsolved and probably insoluble—that has a seductive attraction for me. I think the insolubility is the attraction. Historical and literary mysteries: What was the origin of Hitler's hatred? Did Shakespeare revise *Hamlet*? And I'm particularly troubled by *metaphysical* mysteries, the essential but oh-so-slippery mysteries of existence. Why is there something rather than nothing? What is the origin and nature of consciousness? What distinguishes living from nonliving being?

I can't get past the idea that they may never be solved. And what's most irritating is when people seem unaware they have *not* been solved. Or when people who should know better proclaim there are no real mysteries left. Consider, for instance, the problem of the origin and nature of consciousness. The failure to solve it without resorting to religion or quasi-religious "intelligent design"—which offers no real resolution since it doesn't explain what created the consciousness behind the intelligence of intelligent design—strikes many observers as dangerous. Dangerous because it threatens the foundation of scientific rationalism and materialism. Dangerous because it disrupts one's sense of any order in the universe and opens the floodgates of chaos.

Consciousness is the only thing in the world and the greatest mystery." This was Martin Amis at recent prepublication celebration of Nabokov's *The Original of Laura*, at the 92nd Street Y, paraphrasing Nabokov, whose ability to evoke the tenor and texture of consciousness may be one of his most distinctive talents as a writer. Did it come from the fact that Nabokov was gifted with "synesthesia"—itself a mystery of consciousness—which he experienced as the ability to *see* sounds as sight, as colors? The sound made by the letter "K" for instance, is something he said he experienced as the color of huckleberry. What an extraordinary, colorful spectacle his own words on the page must have been to him. If only we could reproduce it as he saw it.

(By the way, one of the reasons I had reservations about the publication of *Laura* was that I worried people would review it as a finished book when in fact it was an early draft. What I didn't expect was that people who claimed to share these concerns went ahead and reviewed it as though it were a finished book, gleefully heaping scorn on Nabokov's less well-turned phrases.)

But even for those of us who don't have synesthesia, the pageant, the palette of consciousness is one of life's great unsolved mysteries. I was reminded of the vexing mystery of consciousness a few days before the Nabokov event when I found a link on the valuable *Bookforum* blog to an essay in the *Philosophers' Magazine* by Raymond Tallis, a philosopher whose regular critiques of Postmodernism and its metaphysics (especially those of Foucault) I'd admired for some years in the London *Times Literary Supplement*.

Here, in an essay titled "The Unnatural Selection of Consciousness," Tallis took on what he regards as the overconfident assumptions of some evolutionists, who argue that the problem of the evolution of consciousness will be solved the same way the problems of the evolution of the Panda's thumb or the beak of the finch had been.

Neither Tallis, an atheist, nor I, an agnostic, are anti-evolutionists. I hope science will one day offer an explanation for the emergence of *awareness* from unconscious matter. I'd like to know how consciousness is preserved, coded, and expressed by the genes, and whether we should then start worrying that consciousness is genetically determined, which therefore implies the impossibility of free will. Not to mention the answer to even more fundamental questions about consciousness, or more accurately *awareness*: What is it? That is, is it made up of the same elementary particles, the quarks that make up the rest of the universe? If not, what sort of material is it? Where does it exist? If it exists in the mind, is the mind contained in the brain? Does the mind differ from the brain? Is it *determined* by the brain and thus functionally nonindependent?

I'd be happy if science could explain all that. It would make for a simpler, less annoyingly mysterious world.

For some time, however, I have resigned myself to the so-called "Mysterian" position on this question offered by the Oxford-trained philosopher Colin McGinn, who argued in a illuminating book (melodramatically titled *The Mysterious Flame*) that we may *never* find an explanation of consciousness because (to oversimplify a bit) we are trapped *within* consciousness. One thing the book has going for it is its profound humility before the mystery it confronts.

Tallis takes on the problem from a different angle. He questions whether consciousness can be explained as an evolutionary development. Tallis points out that consciousness remains a mystery even to hard-core evolutionary scientists and cites a passage from the Darwinist/atheist Richard Dawkins' *The Blind Watchmaker*:

"Cumulative selection, once it has begun, seems … powerful enough to make the evolution of intelligence probable, if not inevitable." *Seems* "powerful enough"? That doesn't sound very scientific. It sounds, in fact, like faith-based overconfidence in science, an admission that we have no answer, just hope that one will develop. Just as many religious types hope for the coming of the Messiah in a fiery apocalypse.

In fact, Dawkins' all-too-casual, almost dismissive language here offers a rare admission of a big open question: the fact that neither he nor his theory has yet to find a scientific explanation of—even to agree on a *definition* of—consciousness. It always makes me queasy when advocates of science take cheap shots at creationism and intelligent design as if they have All the Answers themselves. I am deeply skeptical about intelligent design, too, but it's important to acknowledge that "our" side doesn't have all the answers, that no matter how much we know, mysteries remain. Someday, science may well explain how a random mutation resulted in consciousness where none had been before.

Tallis is particularly good on the old argument about the evolution of the eye. He *doesn't* say that the human eye could never have been achieved through evolution because of its "irreducible complexity," as the intelligent-design advocates do. Rather, he points out the difference between explaining the development of a complex and sensitive means for registering the visual world and explaining the nature, location, and *stuff* of visual *awareness*:

Firstly, chemical or electrochemical sensitivity to light is not the same as awareness of light. Secondly, the content of awareness of light—brightness, color, never mind beauty or meaning—is not to be found in electromagnetic radiation, which is not intrinsically bright, colored, beautiful or meaningful. These secondary and tertiary qualities are not properties of the physical world and the energy in question. Thirdly, it is not clear how certain organizations of matter manage to be aware—of impingements of energy, and later of objects, and (in the case of humans) of themselves—when very similar organizations of matter do not have this property. This problem is more evident much further down the evolutionary path, when we look at neurons that are, and those that are not, associated with consciousness in the human brain and see how little distinguishes them. The biological story of the evolution of the eye from single cells to full-blown eyes tells us nothing about the journey from light incident on photosensitive cells, producing a programmed response, to the gaze that looks out and sees, and peers at, and inquires into, a visible world. …

Computers, after all, do not get any nearer to being conscious as the inputs are more complexly related to their outputs, however many stages and layers of processing intervene between the two. There is nothing, in short, that will explain why matter in a certain form will go "mental".

I disagree with Tallis on at least one point. He insists that consciousness must have an adaptive evolutionary explanation. And indeed human consciousness may at first have been adaptive. But adaptive functions can go awry, as when a species' reproductive capacity outstrips its food supply. And if you look at the last century in terms of war and slaughter and genocide, you have to wonder whether the more violent tendencies of consciousness are turning out to be maladaptive. Otherwise, why would we consciously place our species in danger of extinction through a Faustian bargain with nuclear physics?

Like Tallis, Colin McGinn is particularly good in condemning materialist explanations of consciousness, pointing out that it's impossible to collapse the mind into the brain. Or, as he puts it: "[T]he mind is … meat neither more nor less." To the materialist the feeling of "pain, for example, is nothing more than a firing of certain fibers in the brain. The feeling of pain simply *reduces* to such physical processes. The two are not merely correlated; they are *identical*." To the materialist, Mr. McGinn continues, "the mind is the brain in disguise. The djinn *is* the lamp."

He goes on to point out that he could hypothetically "know everything about your brain of a neural kind … its anatomy, its chemical ingredients, the pattern of electrical activity in its various segments … the position of every atom and its subatomic structure … everything that that materialist says your mind is. Do I thereby know everything about your mind? It certainly seems not. On the contrary, I know nothing about your mind. I know nothing about which conscious states you are in … and what these states feel like to you..."

If they are not, if in fact consciousness is an instance of dualism—of the mind being somehow different, not identical with the brain—of what then is the nonmaterial "stuff" of consciousness, the "self" and all

that, made? Philosophers tie themselves into knots seeking to resolve these questions. (Thomas Nagel's review of Galen Strawson's new book, *Selves: An Essay in Revisionary Metaphysics*, in the *London Review of Books* is a particularly good display of the incredible difficulties of the problem, although my favorite recent book on the subject is the brief but cogent *Seeing Red* by Nicholas Humphrey.)
Another acute critic of the pure materialist theory of consciousness is the mathematician and philosopher David Berlinski, whose impressively argued critique of scientific certainty on the subject can be found in his new book, *The Devil's Delusion*. Berlinski has suffered—unfairly, I think—from the fact that his work often appears in the pages of a religiously-oriented publication (*Commentary*) and from the suspicion that he has some hidden creationist or intelligent-design agenda. Which he explicitly disclaims. Berlinski is scrupulous not to suggest that he has the answer or that God is the answer or any of that. He just doesn't think, when it comes to the evolution of "awareness," that anybody has All the Answers. Or any of them.
McGinn and Tallis and Berlinski: the mysterians! "Metaphysical heretics" might be more dignified, but I like the fact that from Mysterians take the name from the '60s one-hit-wonder rock group Question Mark and the Mysterians, best known for "96 Tears," which became a seminal influence on punk and No Wave later on. They've got what you might call a philosophical version of a punk rock attitude toward on these questions, a disdain for the nobs who sit on their fat certainties. I consider them heroic for entertaining heresies that dismay the religious and the irreligious, both of whom claim too much.
It's a difficult place to be, not knowing whether one can know the answer to the deepest mysteries. I think David Foster Wallace—particularly in his book on infinity—felt this acutely. He was a Mysterian.
Hamlet was: "There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy," he says. (At least, that's how it appears in the Quarto of the play; in the Folio it's "in *our* philosophy." Did Shakespeare revise? We still don't know.) Nabokov: I don't see him as a Mysterian. I think he saw it all like Milton's God did, spread out in space and time before him. He wasn't a Mysterian because "it" wasn't a mystery to him. Part of what is intriguing about his work is the way you get glimpses of his vision, his metaphysical synesthesia. When I say the mystery of consciousness is a dangerous one, what I mean is that nobody wants to admit they don't have things All Figured Out, and it's particularly destabilizing not figuring yourself out. Where do my thoughts come from? Are they determined by my biochemistry? Is my reaction to this column the product of free will? If I had the time, I would establish an international Mysterian society for those who recognize that the universe is still a profoundly mysterious place and yet don't want to be alone thinking dark thoughts about it. That's really all I want to do. It bothers me. I want it to bother others, too.The same goes for the other two primordial unanswered questions on the borderline of physics and metaphysics:
First: *Why is there something rather than nothing?* And second: *What exactly is the crucial difference between nonliving and living entities?*
Ever since Stephen Hawking's book *A Brief History of Time* became a best-seller (and despite the fact he now admits he was wrong about his entire theory of black holes in that book), many physicists would have us believe that string theory (or "m-theory," as it's now most fashionably called) explains why there is something rather than nothing. One of the latest fashionable theories of why there is something rather than nothing is called "quantum tunneling," which seems to posit that being came into being by means of insubstantial equations or "quantum fluctuations in a vacuum." Sorry, guys, but if there are fluctuations in it, then there's Something in it, already. It's not Nothing, if you see what I mean. Jim Holt does a great job discrediting quantum tunneling and other such something-from-nothing quantum theory dodges in this podcast interview. Holt is writing a whole book about the attempts, so far futile, to solve the Something/Nothing question. The final Big Three Unsolved Mystery: pinpointing the very beginning of life. I'm satisfied Darwinian theory can explain everything from the evolution of the very first "living" entity from a single cell to Nabokov. But I have yet to see any persuasive explanation of the jump from no life to life and how it came about. Please don't refer me to that discredited old chestnut of an experiment in which an electric current was run through a soup of organic molecules and some amino acids were found. Amino acids are chemicals, not life, and ceaseless attempts to create life—to manipulate those amino acids in such a way that they start replicating and evolving in a beaker in one way or another—have failed, as Berlinski painstakingly demonstrated.
It seems to me that people should care more that these questions are not answered. Or stop living in denial, thinking they have been. I don't think religion has the answers, but I don't think science does either. Yet. Whether it ever will is the fourth great mystery.

http://www.slate.com/id/2236563/

**Old Books Gassier With Age**

**Scientists may not be able to tell a good book by its cover, but they now can tell the condition of an old book by its odor.**

By Cristen Conger | Wed Dec 02, 2009 04:33 AM ET

Old books give off an unmistakable, musty odor. Scientists have developed a new test that can measure the condition of old books and precious historical documents on the basis of their aroma.
*EurekaAlert/Wikimedia Commons*

Perhaps you can't judge a book by its cover, but there's a wealth of information to be gleaned from its scent.

A new testing method can rapidly determine the condition of old books and documents by analyzing the bouquet of volatile organic compounds (VOCs) released by paper off-gassing. The technology promises to help conservators assess the condition of old works quickly, while not harming the documents.

"Paper emits more than 200 various compounds of which on the basis of our research we were able to pinpoint to 10 or 15 compounds that carry the most information about the composition of paper," said Matija Strlie, lead researcher and senior lecturer at the Center for Sustainable Heritage at the University College London.

Strlie and his team surveyed the VOC emissions from 72 paper samples in different stages of decay. From those results, the researchers developed a series of scent markers for the structural stability of documents, books and other paper materials.

The familiar odors of old books, which Strlie's study describes as "a combination of grassy notes with a tang of acids and a hint of vanilla" varies depending on the chemical reactions and oxidation rates of paper ingredients, such as ash, cellulose, rosin and lignin.

The paper manufacturing era of each book can also reveals a lot about its condition.

"It's really the technology revolution after 1850 that led to what we call 'acid paper' that degrades very rapidly," Strlie told Discovery News. "Today, for books produced from 1890 to 1900, the pages are already very brittle."

With current testing technology, analyzing such fragile books and heritage documents for preservation and exhibition is often a tedious process. This new scent test, however, could save conservators time and allow them to examine the papers nondestructively.

"Today's technology is, generally speaking, very sufficient. However, the challenge in analyzing historical paper is that we are in need of non-destructive, non-invasive analytical tools," said Gerrit de Bruin, head of conservation for the National Archives of the Netherlands, who has also studied paper testing.

Book conservators have multiple testing methods at their disposal, including pH analysis, paper folding and infrared spectroscopy, but most require handling or sampling, which could potentially damage the delicate documents.

"Water stains on the paper, even when they are dried up by the conservator, and not visible directly after pH measuring, can give side effects such as so called 'tide lines' (lines caused by dirt shifting in the paper) in the near future," de Bruin said.

As Strlie continues to refine the scent testing method, he hopes to apply the technology to portable "handheld electronic noses" that conservators could easily use.

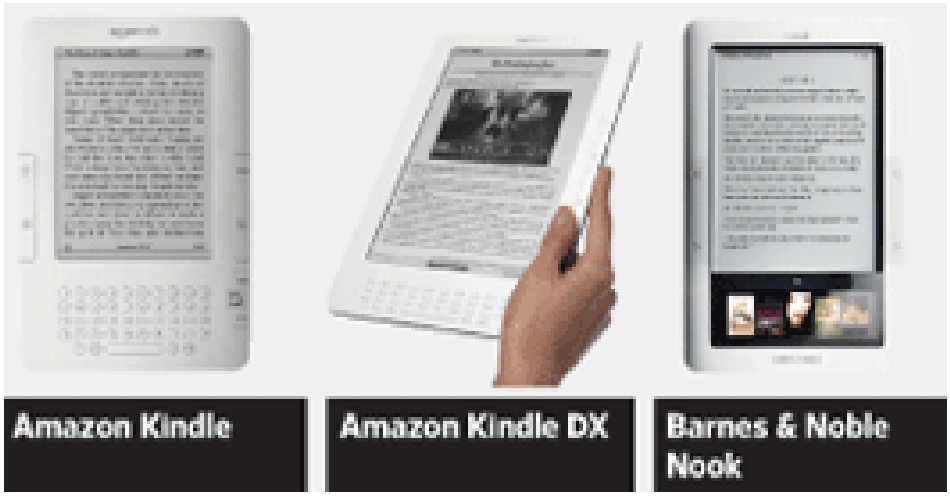
The tool could be particularly beneficial for book conservators like Vanessa Haight Smith, who works with the Smithsonian Library's collection of 1.5 million works.

Due to the myriad factors that contribute to paper degradation -- including water damage, insect droppings and environmental conditions -- and the time-consuming process of surveying older paper products, Smith says the Smithsonian usually requires a year to prepare exhibition pieces.

"[The smell test technology] would be very helpful because in our site we're limited in staff and time, and if we know the chemical breakdown or molecules to a certain level, we can treat it more directly and appropriately," Smith told Discovery News.

http://news.discovery.com/history/old-books-paper-chemical-test.html

**E-Readers: They're Hot Now, But the Story Isn't Over**




**By GEOFFREY A. FOWLER**

Books are having their iPod moment this holiday season. But buyer beware: It could also turn out to be an eight-track moment.

While e-reading devices were once considered a hobby for early adopters, Justin Timberlake is now pitching one on prime-time TV commercials for Sony Corp. Meanwhile, Amazon.com Inc.'s Kindle e-reading device has become its top-selling product of any kind. Forrester Research estimates 900,000 e-readers will sell in the U.S. in November and December.

WSJ's Geoffrey Fowler joins the News Hub and discusses the "format wars" and other pitfalls to avoid when buying an e-reader this holiday season.

But e-reader buyers may be sinking cash into a technology that could become obsolete. While the shiny glass-and-metal reading gadgets offer some whiz-bang features like wirelessly downloading thousands of books, many also restrict the book-reading experience in ways that trusty paperbacks haven't, such as limiting lending to a friend. E-reader technology is changing fast, and manufacturers are aiming to address the devices' drawbacks.

"If you have the disposable income and love technology—not books—you should get a dedicated e-reader," says Bob LiVolsi, the founder of BooksOnBoard, the largest independent e-book store. But other people might be better-off repurposing an old laptop or spending $300 on a cheap laptop known as a netbook to use for reading. "It will give you a lot more functionality, and better leverages the family income," he says.

For gadget lovers, several factors are converging to make e-reading devices alluring this holiday season. More such devices are debuting than ever to challenge Amazon's Kindle, notably the Nook from Barnes & Noble Inc. Sony also recently launched three new versions of its Reader, which will be sold—along with devices from smaller makers like Irex Technologies BV—in dedicated e-book sections of Best Buy Co. stores. Already, these devices are beginning to sell out: Barnes & Noble says people who ordered the Nook after Nov. 20 won't get one until the week of Jan. 4, and Sony says that it can't guarantee delivery of its high-end wireless Reader by Christmas.

There's also more selection of books for the devices, with most popular publishers now selling e-books. Also, library-scanning efforts by Google Inc. is producing more than a million out-of-copyright books

like "The Adventures of Tom Sawyer" that people can download free. There are only a few holdouts against e-books, including "Harry Potter" author J.K. Rowling.

Prices for e-book readers are also dropping. Amazon recently cut the price of the international Kindle to $259 from $279, while Sony sells a new entry-level model for $199. A refurbished first-generation Kindle retails on Amazon for $219. Amazon, Barnes & Noble and other bookstores are also discounting prices on best-selling e-book titles to $10 to lure more readers.

Still, it's unclear how—and on what sort of device—most people will be comfortable reading e-books. Many people seem perfectly happy reading books on their PCs: Reading Web site Scribd.com, which offers millions of amateur and professional works, is attracting 50 million readers each month. LibreDigital Inc., a distributor of e-books for publishers, says the overwhelming majority of e-book buyers are women who read e-books on an ordinary computer screen, mostly between 4 p.m. and 11 p.m. A growing number of readers are also perusing books on cellphones.

Most of the current crop of dedicated e-reading devices try to replicate the traditional reading experience with a screen that's about the size of a paperback novel that displays black-and-white (or, rather, dark grey and light grey) text and graphics. You turn the page by clicking on a button, or using your finger or a stylus to touch the screen. You can buy books online and transfer to them your device with a cable or, on some models, download them directly via a wireless connection. Most e-books, which cost about $10 for popular new titles, are yours at least for the life of your device, though some models let you borrow books for a short period of time from libraries or a friend.

Fans of e-readers acknowledge the devices have their flaws. Dianna Broughton, a 45-year-old stay-at-home mom in Lancaster, S.C., bought a Kindle last year and says she now "reads more, and my kids read more."

But Ms. Broughton says she can't recommend the Kindle to people who aren't technically savvy and might want to purchase their books anywhere other than the Amazon store. That's because the Kindle doesn't read copyright protected files from other bookstores or libraries. It also makes it tough for parents to monitor what their children are reading, if a child has a Kindle that is registered to his parent's Amazon account.

"The parent's entire e-book archive is accessible to that child's Kindle–individual titles can't be locked out," says Ms. Broughton. "Parental controls are one of the most wished-for features." There are technical work-arounds for some of these issues, but they require downloading unofficial software.

Indeed, many e-book readers place limits on how and where consumers can use them. Only the Nook allows people to share some of their books with a friend by wirelessly transmitting them—and even then, you can share each book just once and only for 14 days. And only Sony's Readers make it easy to check out free books from Overdrive Inc., the e-book service used by many public libraries.

The e-book market is also caught up in a format war, with different companies limiting their devices to certain kinds of e-books, with file types such as .azw and mobipocket on the Kindle and .epub and Adobe Digital Editions on Sony. As a result, there's no guarantee an e-book bought from one online store will work on devices sold by a competitor.

Sony has tried to differentiate itself in e-books by supporting an open industry standard called Epub and digital-rights-management software from Adobe. Barnes & Noble recently said it will do the same. But Amazon, which dominates the e-reader market, has so far shown no signs of changing from its own proprietary format.

Amazon says it is working on making Kindle books play on more devices, including iPhones, BlackBerrys and PCs.

"Our goal is to create the best possible reading experience for customers," says Amazon's vice president of Kindle, Ian Freed. "Along the way, we have figured out that it is pretty important to do that with a range of devices."

" My wife's Kindle is nice and functional, but for that money I should have gotten her a netbook. "

—Christopher Capot

For now, the lack of interoperability in e-books has tripped up readers like Maria Blair, a 61-year-old lab technician in Baltimore. She decided to switch from the Kindle to the Sony Reader last year, because she preferred the weight and feel of the Sony. But now, "I'm not able to read the books I bought for the Kindle on my Sony," she says.

Future e-book readers may be a lot more interactive. Plastic Logic says it will launch a business-oriented reading device early next year that will offer the largest screen yet (8½ inches by 11 inches), along with tools to help business people manage their documents on the go. And while all of the dedicated e-book readers on the market this holiday season use black-and-white screens, color screens are coming late next year.

Next year, Apple Inc. is also expected to debut a tablet device that can be used for reading, watching movies, surfing the Web and other interactive tasks.

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http://online.wsj.com/article/SB10001424052748704328104574519851557848662.html?mod=WSJ_hpp_MIDDLENexttoWhatsNewsThird

**Is Loneliness Contagious?**

***Loneliness can be spread as easily as the common cold, according to a new study.***

Tue Dec 01, 2009 02:40 PM ET | content provided by Lisa Grossman, Science News

Staying socially connected may be just as important for public health as washing your hands and covering your cough. A new study suggests that feelings of loneliness can spread through social networks like the common cold.

"People on the edge of the network spread their loneliness to others and then cut their ties," says Nicholas Christakis of Harvard Medical School in Boston, a coauthor of the new study in the December *Journal of Personality and Social Psychology*. "It's like the edge of a sweater: You start pulling at it and it unravels the network."

This study is the latest in a series that Christakis and James Fowler of the University of California, San Diego have conducted to see how habits and feelings move through social networks. Their earlier studies suggested that obesity, smoking and happiness are contagious.

The new study, led by John Cacioppo of the University of Chicago, found that loneliness is catching as well, possibly because lonely people don't trust their connections and foster that mistrust in others.

Loneliness appears to be easier to catch from friends than from family, to spread more among women than men, and to be most contagious among neighbors who live within a mile of each other. The study also found that loneliness can spread to three degrees of separation, as in the studies of obesity, smoking and happiness. One lonely friend makes you 40 to 65 percent more likely to be lonely, but a lonely friend-of-a-friend increases your chances of loneliness by 14 to 36 percent. A friend-of-a-friend-of-a-friend adds between 6 and 26 percent, the study suggests.

Not all networks researchers are convinced. Jason Fletcher of the Yale School of Public Health says that the studies' controls are not good enough to eliminate other explanations, like environmental influences or the tendency of similar people to befriend each other. Fletcher has published a study (in the same issue of the *British Medical Journal* that reported that happiness is contagious) showing that acne, headaches and height also appear to spread through networks even though they are not likely to be transmitted socially.

"We're on the side that (social contagion) exists -- we're not naysayers," Fletcher says. "We just think the evidence isn't clear enough on many of the outcomes."

Despite its shortcomings, some researchers are enthusiastic about the study.

"I think this is a groundbreaking paper in loneliness literature," says Dan Perlman, a psychologist at the University of North Carolina at Greensboro who specializes in loneliness. "Maybe there are people who are skeptical, but this is important work. I think that it should get a pat on the back."

Christakis and Fowler examined data from a long-term health study based in Framingham, Mass., a small town where many of the study's participants knew each other. The Framingham study followed thousands of people over 60 years, keeping track of physical and mental heath, habits and diet.

Each participant also named friends, relatives and neighbors who might know where they would be in two years, when it was time for the next exam. From this information, Christakis and Fowler reconstructed the social network of Framingham, including more than 12,000 ties between 5,124 people. The researchers plotted how reported loneliness, measured via a diagnostic test for depression, changed over time.

The results indicate that lonely people tend to move to the peripheries of social networks. But first, lonely people transmit their feeling of isolation to friends and neighbors.

Feeling lonely doesn't mean you have no connections, Cacioppo says. It only means those connections aren't satisfying enough. Loneliness can start as a sense that the world is hostile, which then becomes a self-fulfilling prophecy.

"Loneliness causes people to be alert for social threats," Cacioppo says. "You engage in more self-protective behavior, which is paradoxically self-defeating." Lonely people can become standoffish and eventually withdraw from their social networks, leaving their former friends less well-connected and more likely to mistrust the world themselves.

Because loneliness is implicated in health problems from Alzheimer's to heart disease, Cacioppo says, reconnecting to those who have fallen off the network may be vital for public health.

http://news.discovery.com/human/loneliness-contagious-social-networks.html

**Bad Teeth Tormented Ancient Egyptians**

***A systematic review of more than 3,000 mummy analyses reveal ancient Egyptians suffered from periodontal diseases, abscesses and cavities.***

By Rossella Lorenzi | Thu Dec 03, 2009 04:16 AM ET

Worn teeth, periodontal diseases, abscesses and cavities tormented the ancient Egyptians, according to the first systematic review of all studies performed on Egyptian mummies in the past 30 years.

After examining research of more than 3,000 mummies, anatomists and paleopathologists at the University of Zurich concluded that 18 percent of all mummies in case reports showed a nightmare array of dental diseases.

"Evidence of dental disorders is plentiful because usually teeth are among the best preserved parts of a body. As for other diseases, the published studies do not always provide in-depth details. Nevertheless, we came across some interesting findings," senior author and medical doctor Frank Ruhli, head of the Swiss Mummy Project at the University of Zurich, told Discovery News.

Published in the *Journal of Comparative Human Biology (HOMO)*, the review takes into consideration all studies published since 1977, when computed tomography was first applied to ancient Egyptian mummies.

CT imaging revealed an impressive collection of diseases, including bone disorders, infections and traumas being the most common disorders.

Out of 85 single-listed mummies, Ruhli and colleagues counted 15 cases of degenerative disorders, with a dominating number of osteoarthritis cases and four cases which specifically diagnosed atherosclerosis (a hardening of the arteries).

Infectious diseases among the mummies were also very common. In three cases the subjects most likely suffered from chronic infectious middle ear disease; other infectious diseases included tuberculosis and gangrenous stomatitis, an often fatal gangrene of the cheek and gums which affects mostly children.

Seven mummies showed evidence of Plasmodium falciparum, the most malignant form of malaria. Ten cases showed symptoms of tumorous lesions, with four of them possibly malignant.

Eleven cases showed evidence of pulmonary diseases, which included pneumonia, emphysema and lung oedema.

"Interestingly, most pulmonary affections were related to the presence of anthracotic pigment [carbon] in the lungs. This suggests air pollution by smoke from fires or oil lamps," Ruhli said.

Bone disorders and trauma abounded. The most prominent cases of fractures in pharaohs included the left middle finger in Ramses II, the third ruler of Egypt's 19th Dynasty, better known as Ramesses the Great, and the skull lesions of Seqenenre Taa II, the 14th pharaoh of the Theban dynasty who probably died in a battle.

Most mummies dated to 3,500 to 2,000 years ago, a period when the embalming process was highly developed. However, despite the large number of reported diseases, much mystery remains about the mummies.

"Sex wasn't determined or reported for about a third of the examined mummies, moreover very few studies mention the cause of death," Ruhli said.

Indeed, for the vast majority of studies, the cause of death -- which came between ages 20 and 40 for half of the mummies -- was either not considered or remained vague.

"The embalming treatment and the nature of certain diseases make it difficult to diagnose mummies. For example, diarrhea, which is still a very common cause of death among children in third world countries, would not really leave visible signs in mummies," Ruhli said.

Only in four cases the cause of death was reported with high certainty, with the culprit being pneumonia, pulmonary oedema, neurofibromatosis and chronic otitis.

In the remaining cases, the possible cause of death seemed to be due to a trauma, infectious diseases, unspecified inflammatory process, malnutrition and in one case, homicide.

"The lack of information about the cause of death in Egyptian mummies can be explained by the embalming process itself, which removed the internal organs. Many diseases involving those organs could not be easily diagnosed," said Gino Fornaciari, professor of forensic anthropology and director of the Pathology Museum at the University of Pisa.

http://news.discovery.com/archaeology/mummies-teeth-disease-diagnosis.html

**The world looks different if you're depressed**

- 30 November 2009 by **Jessica Hamzelou**

Magazine issue 2736.

Not so easy to spot the finer details (Image: Jason Todd/Getty)

DEPRESSION really does change the way you see the world. People with the condition find it easy to interpret large images or scenes, but struggle to "spot the difference" in fine detail. The finding hints at visual training as a possible treatment.

Depressed people have a shortage of a neurotransmitter called GABA; this has also been linked to a visual skill called spatial suppression, which helps us suppress details surrounding the object our eyes are focused on - enabling us to pick out a snake in fallen leaves, for instance.

Now Julie Golomb and colleagues at Yale University are trying to link this ability with major depressive disorder (MDD). Golomb asked 32 people to watch a brief computer animation of white bars drifting over a grey and black background, and say which way they were moving. A quicker response gave a higher score. Half of the group had good mental health, while the rest had recently recovered from depression. The latter were chosen so that medication would not interfere with the results, but Golomb thinks results from people with MDD would be similar because the condition is thought to have genetic factors.

When the image was large, the recovered volunteers found the task easier, which means they would do better in the forest scenario. But they performed less well than the other group when looking at a small image. "Their ability to discriminate fine details was impaired, which is the sort of perception that we tend to use on a daily basis," says Golomb (*Journal of Neuroscience*, DOI: 10.1523/jneurosci.1003-09.2009).

"Depression is often thought of as just a mood disorder," she says, "but it can impact upon eating and sleeping habits, and now we know it can even affect the way a person sees the world."

Depression is not just a mood disorder: now we know it can affect the way a person sees the world

In a commentary on the study, Pascal Wallisch and Romesh Kumbhani of New York University propose that perception training could offer a therapy for people with MDD. Golomb says this could be possible, but it's unclear if training would increase levels of GABA.

http://www.newscientist.com/article/mg20427365.000-the-world-looks-different-if-youre-depressed.html

**Story? Unforgettable. The Audience? Often Not.**

By BENEDICT CAREY

If a friend is someone who laughs at our stories, then a good friend is one who enjoys them even the second time around. But anyone who gasps with delight on hearing a story for the third time is faking it. Or, it's a relative: some poor nephew Will or aunt Emily, sitting captive at the holiday table, being polite, perhaps covering a shudder of dread that life is caught in some endless loop where the punch lines never change.

It is not an entirely irrational fear, either, according to new research published in the journal Psychological Science.

"You hear people of all ages, not just elderly people, say, 'Stop me if I've told you this before,' " said Nigel Gopie, a postdoctoral fellow at the Rotman Research Institute, in Toronto, who has a paper in the current issue of the journal on these memory lapses.

"We often have a hard time remembering who we told things to, and clearly it starts early."

In their long study of memory, psychologists have made important distinctions between the short-term and long-term varieties. They have documented crucial differences between explicit memories, like for faces and vocabulary, and the implicit kind, like for driving skills. They have published hundreds of studies on autobiographical memory, false memories and so-called source memory — the ability to recall where a fact was learned, whether from the radio or a book, from a work colleague or the neighborhood gossip.

Yet they have paid little, if any, attention to what Dr. Gopie and his co-author, Colin M. MacLeod of the University of Waterloo, in Ontario, call destination memory: about whose ears information has landed on. While the source of remembered information can be crucially important (*Did I read that in The Onion or the daily newspaper?*), so is its destination. Our stories, our jokes, our gossip form an important part of our social identity, psychologists say. Repeating oneself is not only embarrassing; it can be damaging, for diplomats, liars or anyone else trying to guard secrets, personal or professional.

"I think people simply get a lot more practice monitoring the sources of information, asking themselves and others, 'Where is that from?' " said Morris Moscovitch, a psychologist at the University of Toronto. "Whereas, it's rare we get any feedback about" whom we told.

The main finding by Dr. Gopie and Dr. MacLeod — that destination memory is relatively weak — helps explain several embarrassing, and annoying, kinds of social interaction. In one experiment, they had 60 University of Waterloo students associate 50 random facts (a shrimp's heart is in its head; 8 percent of men are color blind) with the faces of 50 famous people, like Madonna, Wayne Gretzky and Oprah Winfrey. Half of the students "told" each fact to one of the faces, reading it aloud when the celebrity's picture appeared on a computer screen. The other half read each fact silently and saw a different celebrity moments afterward.

The students then took a memory test. They chose from face-fact pairs: those which they remembered from learning a fact, and those they remembered from reading facts out loud in the first phase of the study. The students who simulated telling the facts did 16 percent worse on the test than the students who were fed the facts while seeing celebrity faces. The study authors concluded that outgoing information "was less integrated with its environmental context — i.e., the person — than was incoming information."

This makes sense, psychologists say, given what is known about attention: namely, that it is finite. A person who is conveying information, even trivial facts, will devote some mental resources to monitoring what is being said. Self-absorption is also a factor. In another study, Dr. Gopie and Dr. MacLeod repeated the famous-face exercise, with one big difference. This time the facts that the students simulated telling to celebrities were personal ("My zodiac sign is Pisces"). The result was their destination memory worsened significantly.

"Now, the situation may be reversed entirely for highly emotional personal information," like devastating personal anxieties, Dr. Gopie said. "That is, that people are in those cases very aware of whom they told. We just don't know that yet."

The results suggest nonetheless that some of people's most intricate, richly detailed stories — the most self-distracting to tell — are at high risk for being met with rolled eyes that say, "Been there, heard all that."

The tendency to blank on who-I-told-what may in fact reflect the workings of a healthy memory. Psychologists have found evidence that when people reset a password or a new phone number for an old friend, their brain actively suppresses the out-of-date digits. The old numbers are a competing memory, and potentially confounding.

Reprised stories aren't always embarrassing or socially redundant, either. If they are repeated often enough, they become ritual, or, over time, oral history, Dr. Gobie suggests. Still, it is telling that people who have the most invested in who hears what — salesmen, lobbyists — often remind themselves whom they are addressing: "Have I told you, Gail, about the special price we have on laser printers?" That may be sucking up, but it may also be a way of keeping tabs on where the information is going.

That is precisely what the two researchers found in the final experiment reported in their paper. Saying the recipient's name ("Oprah Winfrey, the United States Postal Service handles 40 percent of the world's mail volume!") increased the accuracy of their destination memory.

Researchers say that if destination memory proves significantly weaker in further studies, the next step will be to find out when the risks of such lapses are highest and in whom. An improved understanding of destination memory could help doctors detect age-related memory problems earlier, for instance. It may also be relevant to some models of how memory works.

None of which will bail out the holiday raconteur, caught short in the middle of telling a rerun story. Unless he or she can reshape that tale on the fly, and pass it off as oral history.

http://www.nytimes.com/2009/12/01/health/01mind.html?_r=2&8dpc

**A Christmas Rewrite, as Dickens Edits Dickens**

*By ALISON LEIGH COWAN*

Ángel Franco/The New York Times Some young visitors to the Morgan Library and Museum study the heavily marked-up manuscript for "A Christmas Carol" that Charles Dickens wrote, and rewrote, in 1843.
It is an enduring mystery of English literature: What secrets lie entombed beneath the thick scribbles that Charles Dickens made as he wrote, and rewrote, the 66 pages of "A Christmas Carol" in 1843?

The manuscript of this classic holiday ghost story, written in six weeks to raise much-needed cash, is housed at the Morgan Library and Museum in Manhattan, where it bears all of Dickens's additions and subtractions in his own hand.

On page 3, he inserts "his eyes sparkled" to amplify the portrait of Scrooge's nephew, whose beneficence is crucial to the plot.

On page 12, where Scrooge takes Marley's ghost to be evidence not of the supernatural, but of his own indigestion, ("more of gravy than of grave,") he converts the offending bit of food from being a "spot of mustard" to a less digestible "blot of mustard."

Scholars, on occasion, have been given access to the manuscript, or facsimiles, to learn more about these shapings and shadings.

Michael Slater, an expert on Victorian literature at the University of London, said he, for one, has always admired Dickens's decision to trim a waggish diatribe about Hamlet from page 1. He suspects Dickens made the cut after concluding "it was too much of a digression" or just bad for business to be "making too much fun of Shakespeare.''

For the public, the opportunity to spot such finds has been limited. The manuscript is exhibited each holiday season at the Morgan, but as a matter of expedience, only one page is put on view each year, under glass, in the sumptuous former library of the financier John Pierpont Morgan.

This year, however, the Morgan agreed to allow The New York Times to photograph and display the entire handwritten manuscript online.

Readers of On the Records are invited to click here to examine the high-resolution images and submit what they think is the most interesting edit in the work, either a deletion or an addition, or here to view the entire 66 pages. Declan Kiely, the curator who heads the library's department of literary and historical manuscripts, will review the submissions and pick the one he finds most intriguing. That reader will be invited as my guest to afternoon tea at the Morgan. (The winner is responsible for getting to and from the Morgan at his or her own expense. This offer is void where prohibited by law, and other restrictions may apply.)

Please file your submissions in the comment section below no later than 5 p.m. E.S.T. on Dec. 16 and include the page numbers for any textual changes you unearth. The winner will be announced no later than Christmas Eve. Our apologies for a few lost words on the left-most bound side of the reproductions, which printers call the "gutter" of a book. It was the best that could be done without taking apart the book. Typewritten copy of the final text, which accompanies each page, should be helpful in deciphering what is missing.

"A Christmas Carol" has been housed at 225 Madison Avenue, once the financier's home and now the heart of the museum, since Mr. Morgan bought the manuscript just over a century ago. It went on display this year, turned to page 37, on Nov. 20, and will remain on exhibit until Jan. 10.

This year's page describes a moment when Scrooge hears Bob Cratchit report that the sickly Tiny Tim is "growing strong and hearty.'' Initially, Dickens had Scrooge demand: "Is that so, Spirit?" only to be disabused of that notion by the Ghost of Christmas Present. "The child will die,'' the spirit advises him.

Dickens regretted divulging that fact so soon and restored the passage two pages later in the text, employing a half-cross-out approach with his quill pen that came in handy when he was not quite ready to throw words away.

"I just love this change,'' Mr. Kiely said, "because you see Dickens realizing he's going to save this dramatic moment for later.''

At least one change did not occur until the book was at the printer. You will note that the manuscript is silent on whether Tiny Tim lives. But before the first editions went out the door, a line was curiously inserted on page 65 noting that "and to Tiny Tim, who did not die, he was a second father."

Citing a 2004 book by Michael Patrick Hearn, "The Annotated Christmas Carol," Mr. Kiely said Dickens added that line as "an afterthought."

"In the manuscript, we don't know what happens to Tiny Tim,'' Mr. Kiely confirmed. He said the author must have felt compelled to clarify Tiny Tim's fate after reviewing the galleys to reassure readers that Scrooge's reformation did save one soul besides his own.

At the time "A Christmas Carol" was written, Dickens feared for his own future. He had six children to feed, a large house in London to maintain and a lavish lifestyle. Christmas was approaching. Yet the work he was then producing, a few chapters at a time, "Martin Chuzzlewit,'' was not selling as well as earlier installments of "The Pickwick Papers" or "Nicholas Nickleby." Bitterly, he confided to a friend that his bank account was bare.

John Leech/Courtesy
of Morgan Library and Museum Dickens enlisted John Leech to illustrate "A Christmas Carol." But the watercolor of the Ghost of Christmas Present, above, had to be redone because the spirit was supposed to be wearing green, not red. Below, the corrected version. Click to enlarge.
John Leech/Courtesy
of Morgan Library and MuseumClick to enlarge.
"He did make money but not as much as he thought he would,'' said Professor Slater, the author of "Charles Dickens: A Life Defined by Writing," a new biography for Yale University Press.

Conjuring up what he described as a "Ghost of an Idea," about a rich man's conversion from heel to hero, he got to work. The 6,000 copies printed up in time for Christmas sold out. But because the author had

splurged on hand-colored drawings in red and green ink by John Leech, one of England's leading illustrators, the project was a financial bust.

Fortunately for Dickens, his quickie book went on to become a literary classic. So his Christmases Future were far better than his Christmases Past.

On Friday, six Morgan museum officials — a curator, a registrar, an assistant registrar, a technician, a conservator and a spokesman — oversaw the installation of the manuscript in the elegant period room that once housed Mr. Morgan's personal library.

Alex Confer, a collection technician, used a suction device to open the glass-topped display case, exposing a bright red mat.

"Microsuede,'' Mr. Kiely said.

"Ultrasuede," said John Alexander, the registrar, correcting him.

Cradling the manuscript, Maria Fredericks, a conservator, walked it from a cart to the case. Mr. Kiely approved her placement of the manuscript on a specially designed mount, and added an explanatory label.

"We do a group eyeball to make sure it's straight,'' Ms. Fredericks explained.

Adjustments made, Mr. Confer sealed the case and wiped the glass with alcohol.

First to behold the results was Rob Matthews, 35, an artist from Philadelphia.

"I'm not sure how the printers made this out,'' Mr. Matthews said, squinting. "This is notoriously bad penmanship.''

http://cityroom.blogs.nytimes.com/2009/12/01/a-christmas-rewrite-as-dickens-edits-dickens/

**Classic Botticelli, Ethereal Ad Man**
**By MICHAEL KIMMELMAN**

FRANKFURT — The Botticelli show at the Städel Museum is the first big survey devoted to him in the German-speaking world. The galleries are annoyingly jammed. It's like rush hour all day in there.

Am I the only idiot around who still doesn't quite get his popularity? When Botticelli was a largely forgotten man in the 19th century, it was the Germans, along with the British, who bought his pictures and helped rescue him from near-total obscurity. Some of the best Botticellis outside Italy ended up in Germany as a consequence, including the Städel's "Idealized Female Portrait," around which this show ostensibly revolves. Several dozen pictures by him and others, portraits, mythological and religious scenes culled from hither and yon, round out the exhibition.

It's a glamorous crowd pleaser, naturally, but a mixed bag. Botticelli is akin to Rembrandt or van Gogh. It hardly matters what's in the show, ultimately. People come just for the name.

Yes, he's a beautiful painter, when he's on. And his appeal to traditional connoisseurs is obvious. It grows out of his lyrical humanism and taste for the classics, which endeared him to aesthetes like Bernard Berenson and Walter Pater, who called him a visionary. You might say Botticelli represents a bygone ideal of high art, with its literary roots in rhetoric and poetry, which is to say only that what attracts so many people to him today surely has to do with something else. Is it all that decorative panache and those pretty, melancholy young women? I suspect, as with van Gogh and Rembrandt, it also has to do with the way he devised a signature style that acts like an advertisement for himself. The style was supple, elastic, linear, refined but full of exaggerations, which invite easy mimicry. Extravagant patterning camouflages the invariable chill. He's an abstract artist at heart.

Anime comes to mind.

It's useful to recall that words like artificio, ornato and grazioso weren't put-downs in Botticelli's day. Ornate referred to a type of painting that looked polished, rich and charming. When he painted plants, Botticelli brought to bear a botanist's meticulous eye for detail, and there's a similarly microscopic fussiness about the way he painted rocks and animals and trees and boats. It all came from his training as a goldsmith.

But human figures occupied a higher realm of being in his mind, and with them he strove for artifice. This means his people look like they're made of marble, carved in low relief, occupying not real space but a shallow stage, barely shadowed. Even when the scenes recede conspicuously into some deep landscape or vista — he specialized in those how-to versions of two-point perspective — the action presses against the picture plane and flattens the image. Nature, as a starting point, was never Botticelli's true goal.

The great Botticellis also have an ethereal, haunted eloquence. One of the most memorable exhibitions of the past decade, in London eight years ago, brought together the unbelievably great drawings he did of Dante's "Divine Comedy" (many from the Kupferstichkabinett in Berlin). Botticelli rendered every imaginable torment in hell, almost lovingly. Suffering then yields to visions of paradise, where Botticelli makes ingenious use of white space, equivalent to a rest or silence in music, a linear corollary of the lines of Dante's poetry.

I mention that London show because by contrast this Frankfurt one is, as Botticelli can be, uneven. It has some great works, including his "Minerva and the Centaur," the large "Annunciation" fresco painted originally for the hospital of San Martino alla Scala in Florence and all four panels of "The Life and Miracles of St. Zenobius."

But there is too much workshop and second-rate fare. Drawings, a suit of armor and paintings by contemporaries like Filippino Lippi, Francesco Botticini and Raffaellino del Garbo, in ascending order of obscurity, pad the display, variously. For specialists the mix is a field day. They can tussle endlessly over attributions.

For the rest of us there's a fine sketch of "Judith With the Head of Holofernes," by Giuliano da Sangallo, to admire; another by Lippi of the wide-eyed Archangel Gabriel, his mouth slightly agape, announcing the big news to Mary; and a stucco "Virgin and Child" by Andrea della Robbia, or, perhaps, Antonio Rossellino. The artist isn't certain. But the slow, simple, noiseless grace of the two figures — mother gently squeezing her standing son's tiny left foot — is.

As for Botticelli, John Berger, the British critic and novelist, once wrote of Renaissance art generally that "its superb combination of sensuousness and nobility stemmed from a confidence which cannot be artificially re-created." That's Botticelli in a nutshell. All those long-faced, sinuous, curly-haired Madonnas and goddesses, silent-film starlets, doe-eyed and pouting, naked or draped in clingy, translucent robes, mix sensuousness and nobility in ways that make sex look arcane and clinical.

You don't even notice at first that Minerva's arms are twice too long, her legs too short, her neck like a giraffe's, or that there's a diamond pattern decorating her see-through gown, which connoted virtue to Botticelli's contemporaries. She's simply the dominatrix, the untouchable, slightly alarming embodiment of unearthly beauty, waxen, absently clutching her enormous halberd while bringing man's animal nature, in the tormented guise of the cringing centaur, to heel.

Like most of Botticelli's women she also maintains that mysterious, camera-ready, faraway, model-on-the-runway look — for the artist, no doubt a look of propriety — into which it is possible to read almost anything. Into his Madonnas gazing at the baby Jesus, we can read sad resignation; into his Venuses, arrogance and maybe a Manhattan cocktail or two; into the Städel's portrait of an idealized young woman — what is it, piety? The reverse?

The woman is said to be Simonetta Vespucci, la bella Simonetta, who died of tuberculosis in 1476, in her early 20s, plunging all Florentines, it was said, into mourning. Supposedly Botticelli pined for her ever after, bringing her back again and again in his pictures as the unattainable object of his dreams.

It hardly matters that having never married, Botticelli may have had very different tastes in real life. She came to represent, in her premature death, a cultural symbol to all of Renaissance Florence, promulgated widely through Tuscan literature as well by Botticelli. For him she served as the convenient muse: both Minerva and Madonna, the chaste nymph and the courtesan.

I was in Munich the other day, among other things making a pilgrimage to see Botticelli's "Lamentation," a highlight of the Alte Pinakothek and a painting whose sublime strangeness speaks to me in ways that neither Venus on the half shell nor "Primavera" do. A small crowd clustered around it. The rapturous expression of the grieving Mary improbably supporting an Adonis-like Jesus acts as the weird emotional vortex around which Botticelli orchestrated a swirl of mourners with tilting halos, like windblown wheat. Vivid colors clash to underscore the message. The work is both hot and cold. Steeped in antiquity it also departs slightly from the quality that makes so many, more famous Botticellis look crafty and brittle.

That's the anachronistic view across half a millennium, anyway. Botticelli died in 1510, at around 65, and if he were around now, his rock-star popularity would probably come as a shock to him, even an insult. He painted for intellectuals and potentates. Then he fell under the spell of Savonarola, supposedly burned some of his own pictures in the great bonfire of the vanities and dropped down the memory chute.

The myth of the pining, profligate lover, craving religious consolation in extremis and dying forgotten only to be rediscovered many centuries later as an artistic genius, accounts for his popularity too. His suffering is like van Gogh's ear, the perfect fictive yeast for celebrityhood.

The truth is something else.

It's to do with the vagaries of taste.

http://www.nytimes.com/2009/12/03/arts/design/03abroad.html?ref=design

**We May Be Born With an Urge to Help**
**By NICHOLAS WADE**

What is the essence of human nature? Flawed, say many theologians. Vicious and addicted to warfare, wrote Hobbes. Selfish and in need of considerable improvement, think many parents.

But biologists are beginning to form a generally sunnier view of humankind. Their conclusions are derived in part from testing very young children, and partly from comparing human children with those of chimpanzees, hoping that the differences will point to what is distinctively human.

The somewhat surprising answer at which some biologists have arrived is that babies are innately sociable and helpful to others. Of course every animal must to some extent be selfish to survive. But the biologists also see in humans a natural willingness to help.

When infants 18 months old see an unrelated adult whose hands are full and who needs assistance opening a door or picking up a dropped clothespin, they will immediately help, Michael Tomasello writes in "Why We Cooperate," a book published in October. Dr. Tomasello, a developmental psychologist, is co-director of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany.

The helping behavior seems to be innate because it appears so early and before many parents start teaching children the rules of polite behavior.

"It's probably safe to assume that they haven't been explicitly and directly taught to do this," said Elizabeth Spelke, a developmental psychologist at Harvard. "On the other hand, they've had lots of opportunities to experience acts of helping by others. I think the jury is out on the innateness question."

But Dr. Tomasello finds the helping is not enhanced by rewards, suggesting that it is not influenced by training. It seems to occur across cultures that have different timetables for teaching social rules. And helping behavior can even be seen in infant chimpanzees under the right experimental conditions. For all these reasons, Dr. Tomasello concludes that helping is a natural inclination, not something imposed by parents or culture.

Infants will help with information, as well as in practical ways. From the age of 12 months they will point at objects that an adult pretends to have lost. Chimpanzees, by contrast, never point at things for each other, and when they point for people, it seems to be as a command to go fetch something rather than to share information.

For parents who may think their children somehow skipped the cooperative phase, Dr. Tomasello offers the reassuring advice that children are often more cooperative outside the home, which is why parents may be surprised to hear from a teacher or coach how nice their child is. "In families, the competitive element is in ascendancy," he said.

As children grow older, they become more selective in their helpfulness. Starting around age 3, they will share more generously with a child who was previously nice to them. Another behavior that emerges at the same age is a sense of social norms. “Most social norms are about being nice to other people,” Dr. Tomasello said in an interview, “so children learn social norms because they want to be part of the group.”

Children not only feel they should obey these rules themselves, but also that they should make others in the group do the same. Even 3-year-olds are willing to enforce social norms. If they are shown how to play a game, and a puppet then joins in with its own idea of the rules, the children will object, some of them vociferously.

Where do they get this idea of group rules, the sense of “we who do it this way”? Dr. Tomasello believes children develop what he calls “shared intentionality,” a notion of what others expect to happen and hence a sense of a group “we.” It is from this shared intentionality that children derive their sense of norms and of expecting others to obey them.

Shared intentionality, in Dr. Tomasello’s view, is close to the essence of what distinguishes people from chimpanzees. A group of human children will use all kinds of words and gestures to form goals and coordinate activities, but young chimps seem to have little interest in what may be their companions’ minds.

If children are naturally helpful and sociable, what system of child-rearing best takes advantage of this surprising propensity? Dr. Tomasello says that the approach known as inductive parenting works best because it reinforces the child’s natural propensity to cooperate with others. Inductive parenting is simply communicating with children about the effect of their actions on others and emphasizing the logic of social cooperation.

“Children are altruistic by nature,” he writes, and though they are also naturally selfish, all parents need do is try to tip the balance toward social behavior.

The shared intentionality lies at the basis of human society, Dr. Tomasello argues. From it flow ideas of norms, of punishing those who violate the norms and of shame and guilt for punishing oneself. Shared intentionality evolved very early in the human lineage, he believes, and its probable purpose was for cooperation in gathering food. Anthropologists report that when men cooperate in hunting, they can take down large game, which single hunters generally cannot do. Chimpanzees gather to hunt colobus monkeys, but Dr. Tomasello argues this is far less of a cooperative endeavor because the participants act on an ad hoc basis and do not really share their catch.

An interesting bodily reflection of humans’ shared intentionality is the sclera, or whites, of the eyes. All 200 or so species of primates have dark eyes and a barely visible sclera. All, that is, except humans, whose sclera is three times as large, a feature that makes it much easier to follow the direction of someone else’s gaze. Chimps will follow a person’s gaze, but by looking at his head, even if his eyes are closed. Babies follow a person’s eyes, even if the experimenter keeps his head still.

Advertising what one is looking at could be a risk. Dr. Tomasello argues that the behavior evolved “in cooperative social groups in which monitoring one another’s focus was to everyone’s benefit in completing joint tasks.”

This could have happened at some point early in human evolution, when in order to survive, people were forced to cooperate in hunting game or gathering fruit. The path to obligatory cooperation — one that other primates did not take — led to social rules and their enforcement, to human altruism and to language.

“Humans putting their heads together in shared cooperative activities are thus the originators of human culture,” Dr. Tomasello writes.

A similar conclusion has been reached independently by Hillard S. Kaplan, an anthropologist at the University of New Mexico. Modern humans have lived for most of their existence as hunter gatherers, so much of human nature has presumably been shaped for survival in such conditions. From study of existing hunter gatherer peoples, Dr. Kaplan has found evidence of cooperation woven into many levels of human activity.

The division of labor between men and women — men gather 68 percent of the calories in foraging societies — requires cooperation between the sexes. Young people in these societies consume more than they produce until age 20, which in turn requires cooperation between the generations. This long period of dependency was needed to develop the special skills required for the hunter gatherer way of life.

The structure of early human societies, including their “high levels of cooperation between kin and nonkin,” was thus an adaptation to the “specialized foraging niche” of food resources that were too

difficult for other primates to capture, Dr. Kaplan and colleagues wrote recently in The Philosophical Transactions of the Royal Society. We evolved to be nice to each other, in other words, because there was no alternative.

Much the same conclusion is reached by Frans de Waal in another book published in October, "The Age of Empathy." Dr. de Waal, a primatologist, has long studied the cooperative side of primate behavior and believes that aggression, which he has also studied, is often overrated as a human motivation.

"We're preprogrammed to reach out," Dr. de Waal writes. "Empathy is an automated response over which we have limited control." The only people emotionally immune to another's situation, he notes, are psychopaths.

Indeed, it is in our biological nature, not our political institutions, that we should put our trust, in his view. Our empathy is innate and cannot be changed or long suppressed. "In fact," Dr. de Waal writes, "I'd argue that biology constitutes our greatest hope. One can only shudder at the thought that the humaneness of our societies would depend on the whims of politics, culture or religion."

The basic sociability of human nature does not mean, of course, that people are nice to each other all the time. Social structure requires that things be done to maintain it, some of which involve negative attitudes toward others. The instinct for enforcing norms is powerful, as is the instinct for fairness. Experiments have shown that people will reject unfair distributions of money even it means they receive nothing.

"Humans clearly evolved the ability to detect inequities, control immediate desires, foresee the virtues of norm following and gain the personal, emotional rewards that come from seeing another punished," write three Harvard biologists, Marc Hauser, Katherine McAuliffe and Peter R. Blake, in reviewing their experiments with tamarin monkeys and young children.

If people do bad things to others in their group, they can behave even worse to those outside it. Indeed the human capacity for cooperation "seems to have evolved mainly for interactions within the local group," Dr. Tomasello writes.

Sociality, the binding together of members of a group, is the first requirement of defense, since without it people will not put the group's interests ahead of their own or be willing to sacrifice their lives in battle. Lawrence H. Keeley, an anthropologist who has traced aggression among early peoples, writes in his book "War Before Civilization" that, "Warfare is ultimately not a denial of the human capacity for cooperation, but merely the most destructive expression of it."

The roots of human cooperation may lie in human aggression. We are selfish by nature, yet also follow rules requiring us to be nice to others.

"That's why we have moral dilemmas," Dr. Tomasello said, "because we are both selfish and altruistic at the same time."

http://www.nytimes.com/2009/12/01/science/01human.html?nl=health&emc=healthupdateema1

**A Lost European Culture, Pulled From Obscurity**

**By JOHN NOBLE WILFORD**

Before the glory that was Greece and Rome, even before the first cities of Mesopotamia or temples along the Nile, there lived in the Lower Danube Valley and the Balkan foothills people who were ahead of their time in art, technology and long-distance trade.

For 1,500 years, starting earlier than 5000 B.C., they farmed and built sizable towns, a few with as many as 2,000 dwellings. They mastered large-scale copper smelting, the new technology of the age. Their graves held an impressive array of exquisite headdresses and necklaces and, in one cemetery, the earliest major assemblage of gold artifacts to be found anywhere in the world.

The striking designs of their pottery speak of the refinement of the culture's visual language. Until recent discoveries, the most intriguing artifacts were the ubiquitous terracotta "goddess" figurines, originally interpreted as evidence of the spiritual and political power of women in society.

New research, archaeologists and historians say, has broadened understanding of this long overlooked culture, which seemed to have approached the threshold of "civilization" status. Writing had yet to be invented, and so no one knows what the people called themselves. To some scholars, the people and the region are simply Old Europe.

The little-known culture is being rescued from obscurity in an exhibition, "The Lost World of Old Europe: the Danube Valley, 5000-3500 B.C.," which opened last month at the Institute for the Study of the Ancient World at New York University. More than 250 artifacts from museums in Bulgaria, Moldova and Romania are on display for the first time in the United States. The show will run through April 25.

At its peak, around 4500 B.C., said David W. Anthony, the exhibition's guest curator, "Old Europe was among the most sophisticated and technologically advanced places in the world" and was developing "many of the political, technological and ideological signs of civilization."

Dr. Anthony is a professor of anthropology at Hartwick College in Oneonta, N.Y., and author of "The Horse, the Wheel, and Language: How Bronze-Age Riders from the Eurasian Steppes Shaped the Modern World." Historians suggest that the arrival in southeastern Europe of people from the steppes may have contributed to the collapse of the Old Europe culture by 3500 B.C.

At the exhibition preview, Roger S. Bagnall, director of the institute, confessed that until now "a great many archaeologists had not heard of these Old Europe cultures." Admiring the colorful ceramics, Dr.

Bagnall, a specialist in Egyptian archaeology, remarked that at the time "Egyptians were certainly not making pottery like this."
A show catalog, published by Princeton University Press, is the first compendium in English of research on Old Europe discoveries. The book, edited by Dr. Anthony, with Jennifer Y. Chi, the institute's associate director for exhibitions, includes essays by experts from Britain, France, Germany, the United States and the countries where the culture existed.
Dr. Chi said the exhibition reflected the institute's interest in studying the relationships of well-known cultures and the "underappreciated ones."
Although excavations over the last century uncovered traces of ancient settlements and the goddess figurines, it was not until local archaeologists in 1972 discovered a large fifth-millennium B.C. cemetery at Varna, Bulgaria, that they began to suspect these were not poor people living in unstructured egalitarian societies. Even then, confined in cold war isolation behind the Iron Curtain, Bulgarians and Romanians were unable to spread their knowledge to the West.
The story now emerging is of pioneer farmers after about 6200 B.C. moving north into Old Europe from Greece and Macedonia, bringing wheat and barley seeds and domesticated cattle and sheep. They established colonies along the Black Sea and in the river plains and hills, and these evolved into related but somewhat distinct cultures, archaeologists have learned. The settlements maintained close contact through networks of trade in copper and gold and also shared patterns of ceramics.
The Spondylus shell from the Aegean Sea was a special item of trade. Perhaps the shells, used in pendants and bracelets, were symbols of their Aegean ancestors. Other scholars view such long-distance acquisitions as being motivated in part by ideology in which goods are not commodities in the modern sense but rather "valuables," symbols of status and recognition.
Noting the diffusion of these shells at this time, Michel Louis Seferiades, an anthropologist at the National Center for Scientific Research in France, suspects "the objects were part of a halo of mysteries, an ensemble of beliefs and myths."
In any event, Dr. Seferiades wrote in the exhibition catalog that the prevalence of the shells suggested the culture had links to "a network of access routes and a social framework of elaborate exchange systems — including bartering, gift exchange and reciprocity."
Over a wide area of what is now Bulgaria and Romania, the people settled into villages of single- and multiroom houses crowded inside palisades. The houses, some with two stories, were framed in wood with clay-plaster walls and beaten-earth floors. For some reason, the people liked making fired clay models of multilevel dwellings, examples of which are exhibited.
A few towns of the Cucuteni people, a later and apparently robust culture in the north of Old Europe, grew to more than 800 acres, which archaeologists consider larger than any other known human settlements at the time. But excavations have yet to turn up definitive evidence of palaces, temples or large civic buildings. Archaeologists concluded that rituals of belief seemed to be practiced in the homes, where cultic artifacts have been found.
The household pottery decorated in diverse, complex styles suggested the practice of elaborate at-home dining rituals. Huge serving bowls on stands were typical of the culture's "socializing of food presentation," Dr. Chi said.
At first, the absence of elite architecture led scholars to assume that Old Europe had little or no hierarchical power structure. This was dispelled by the graves in the Varna cemetery. For two decades after 1972, archaeologists found 310 graves dated to about 4500 B.C. Dr. Anthony said this was "the best evidence for the existence of a clearly distinct upper social and political rank."
Vladimir Slavchev, a curator at the Varna Regional Museum of History, said the "richness and variety of the Varna grave gifts was a surprise," even to the Bulgarian archaeologist Ivan Ivanov, who directed the discoveries. "Varna is the oldest cemetery yet found where humans were buried with golden ornaments," Dr. Slavchev said.
More than 3,000 pieces of gold were found in 62 of the graves, along with copper weapons and tools, and ornaments, necklaces and bracelets of the prized Aegean shells. "The concentration of imported prestige objects in a distinct minority of graves suggest that institutionalized higher ranks did exist," exhibition curators noted in a text panel accompanying the Varna gold.
Yet it is puzzling that the elite seemed not to indulge in private lives of excess. "The people who donned gold costumes for public events while they were alive," Dr. Anthony wrote, "went home to fairly ordinary houses."

Copper, not gold, may have been the main source of Old Europe's economic success, Dr. Anthony said. As copper smelting developed about 5400 B.C., the Old Europe cultures tapped abundant ores in Bulgaria and what is now Serbia and learned the high-heat technique of extracting pure metallic copper.
Smelted copper, cast as axes, hammered into knife blades and coiled in bracelets, became valuable exports. Old Europe copper pieces have been found in graves along the Volga River, 1,200 miles east of Bulgaria. Archaeologists have recovered more than five tons of pieces from Old Europe sites.
An entire gallery is devoted to the figurines, the more familiar and provocative of the culture's treasures. They have been found in virtually every Old Europe culture and in several contexts: in graves, house shrines and other possibly "religious spaces."
One of the best known is the fired clay figure of a seated man, his shoulders bent and hands to his face in apparent contemplation. Called the "Thinker," the piece and a comparable female figurine were found in a cemetery of the Hamangia culture, in Romania. Were they thinking, or mourning?
Many of the figurines represent women in stylized abstraction, with truncated or elongated bodies and heaping breasts and expansive hips. The explicit sexuality of these figurines invites interpretations relating to earthly and human fertility.
An arresting set of 21 small female figurines, seated in a circle, was found at a pre-Cucuteni village site in northeastern Romania. "It is not difficult to imagine," said Douglass W. Bailey of San Francisco State University, the Old Europe people "arranging sets of seated figurines into one or several groups of miniature activities, perhaps with the smaller figurines at the feet or even on the laps of the larger, seated ones."
Others imagined the figurines as the "Council of Goddesses." In her influential books three decades ago, Marija Gimbutas, an anthropologist at the University of California, Los Angeles, offered these and other so-called Venus figurines as representatives of divinities in cults to a Mother Goddess that reigned in prehistoric Europe.
Although the late Dr. Gimbutas still has an ardent following, many scholars hew to more conservative, nondivine explanations. The power of the objects, Dr. Bailey said, was not in any specific reference to the divine, but in "a shared understanding of group identity."
As Dr. Bailey wrote in the exhibition catalog, the figurines should perhaps be defined only in terms of their actual appearance: miniature, representational depictions of the human form. He thus "assumed (as is justified by our knowledge of human evolution) that the ability to make, use and understand symbolic objects such as figurines is an ability that is shared by all modern humans and thus is a capability that connects you, me, Neolithic men, women and children, and the Paleolithic painters in caves."
Or else the "Thinker," for instance, is the image of you, me, the archaeologists and historians confronted and perplexed by a "lost" culture in southeastern Europe that had quite a go with life back before a single word was written or a wheel turned.

http://www.nytimes.com/2009/12/01/science/01arch.html?ref=science

**E-Mail Fracas Shows Peril of Trying to Spin Science**

**By JOHN TIERNEY**

If you have not delved into the thousands of e-mail messages and files hacked from the computers of British climate scientists, let me give you the closest thing to an executive summary. It is taken from a file slugged HARRY_READ_ME, which is the log of a computer expert's long struggle to make sense of a database of historical temperatures. Here is Harry's summary of the situation:

Aarrggghhh!
That cry, in various spellings, is a motif throughout the log as Harry tries to fight off despair. "OH [EXPLETIVE] THIS!" he writes after struggling to reconcile readings from weather stations around the world. "It's Sunday evening, I've worked all weekend, and just when I thought it was done I'm hitting yet another problem that's based on the hopeless state of our databases. There is no uniform data integrity. ..."
Harry, whoever he may be, comes off as the most sympathetic figure in the pilfered computer annals of East Anglia University, the British keeper of global temperature records. While Harry's log shows him worrying about the integrity of the database, the climate scientists are e-mailing one another with strategies for blocking outsiders' legal requests to see their data.
While Harry is puzzling over temperatures — "I have that familiar Twilight Zone sensation" — the scientists are confidently making proclamations to journalists, jetting to conferences and plotting revenge against those who question the dangers of global warming. When a journal publishes a skeptic's paper, the scientists e-mail one another to ignore it. They focus instead on retaliation against the journal and the editor, a project that is breezily added to the agenda of their next meeting: "Another thing to discuss in Nice!"
As the scientists denigrate their critics in the e-mail messages, they seem oblivious to one of the greatest dangers in the climate-change debate: smug groupthink. These researchers, some of the most prominent climate experts in Britain and America, seem so focused on winning the public-relations war that they exaggerate their certitude — and ultimately undermine their own cause.
Consider, for instance, the phrase that has been turned into a music video by gleeful climate skeptics: "hide the decline," used in an e-mail message by Phil Jones, the head of the university's Climatic Research Unit. He was discussing the preparation of a graph for the cover of a 1999 report from the

World Meteorological Organization showing that temperatures in the past several decades were the highest of the past millennium.

Most of the graph was based on analyses of tree rings and other "proxy" records like ice cores and lake sediments. These indirect measurements indicated that temperatures declined in the middle of the millennium and then rose in the first half of the 20th century, which jibes with other records. But the tree-ring analyses don't reveal a sharp warming in the late 20th century — in fact, they show a decline in temperatures, contradicting what has been directly measured with thermometers.

Because they considered that recent decline to be spurious, Dr. Jones and his colleagues removed it from part of the graph and used direct thermometer readings instead. In a statement last week, Dr. Jones said there was nothing nefarious in what they had done, because the problems with the tree-ring data had been openly identified earlier and were known to experts.

But the graph adorned the cover of a report intended for policy makers and journalists. The nonexperts wouldn't have realized that the scariest part of that graph — the recent temperatures soaring far above anything in the previous millennium — was based on a completely different measurement from the earlier portion. It looked like one smooth, continuous line leading straight upward to certain doom.

The story behind that graph certainly didn't show that global warming was a hoax or a fraud, as some skeptics proclaimed, but it did illustrate another of their arguments: that the evidence for global warming is not as unequivocal as many scientists claim. (Go to nytimes.com/tierneylab for details.)

In fact, one skeptic raised this very issue about tree-ring data in a comment posted in 2004 on RealClimate, the blog operated by climate scientists. The comment, which questioned the propriety of "grafting the thermometer record onto a proxy temperature record," immediately drew a sharp retort on the blog from Michael Mann, an expert at Penn State University:

"No researchers in this field have ever, to our knowledge, 'grafted the thermometer record onto' any reconstruction. It is somewhat disappointing to find this specious claim (which we usually find originating from industry-funded climate disinformation Web sites) appearing in this forum."

Dr. Mann now tells me that he was unaware, when he wrote the response, that such grafting had in fact been done in the earlier cover chart, and I take him at his word. But I don't see why the question was dismissed so readily, with the implication that only a tool of the fossil-fuel industry would raise it.

Contempt for critics is evident over and over again in the hacked e-mail messages, as if the scientists were a priesthood protecting the temple from barbarians. Yes, some of the skeptics have political agendas, but so do some of the scientists. Sure, the skeptics can be cranks and pests, but they have identified genuine problems in the historical reconstructions of climate, as in the debate they inspired about the "hockey stick" graph of temperatures over the past millennium.

It is not unreasonable to give outsiders a look at the historical readings and the adjustments made by experts like Harry. How exactly were the readings converted into what the English scientists describe as "quality controlled and homogenised" data?

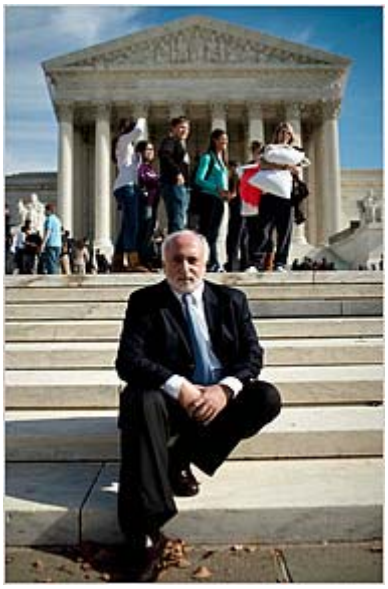
Trying to prevent skeptics from seeing the raw data was always a questionable strategy, scientifically. Now it looks like dubious public relations, too.

In response to the furor over the climate e-mail messages, there will be more attention than ever paid to those British temperature records, and any inconsistencies or gaps will seem more suspicious simply because the researchers were so determined not to reveal them. Skeptical bloggers are already dissecting Harry's work. As they relentlessly pore over other data, the British scientists will feel Harry's pain: Aarrggghhh! There truly is no end in sight.

http://www.nytimes.com/2009/12/01/science/01tier.html?ref=science

**LAURENCE STEINBERG**
**Developmental Psychologist Says Teenagers Are Different**

**By CLAUDIA DREIFUS**



Laurence Steinberg, a developmental psychologist at Temple University in Philadelphia, is one of the leading experts in the United States on adolescent behavior and adolescent brain biology. Dr. Steinberg, 57, has won the $1 million Klaus J. Jacobs Research Prize, which will be awarded to him at a ceremony in early December in Switzerland. Here is an edited version of two conversations with Dr. Steinberg last month:

Q. YOU HEAR PARENTS SOMETIMES SAY, "I'M LIVING WITH AN INSANE PERSON. MY CHILD IS A TEENAGER." ARE THEY BEING HYPERBOLIC?
A. I'm not one of those people who labels adolescence as some sort of mental illness. Teenagers are not crazy. They're different.
When it comes to crime, they are less responsible for their behavior than adults. And typically, in the law, we don't punish people as much who are less responsible. We know from our lab that adolescents are more impulsive, thrill-seeking, drawn to the rewards of a risky decision than adults. They tend to not focus very much on costs. They are more easily coerced to do things they know are wrong. These factors, under the law, make people less responsible for criminal acts. The issue is: as a class, should we treat adolescents differently?
Q. IS THE CRIMINAL JUSTICE SYSTEM BEGINNING TO TAKE THESE DIFFERENCES INTO ACCOUNT DURING SENTENCING?
A. It's been coming up in cases. I went to Washington in November to watch the oral arguments in two related cases before the Supreme Court that ask: should someone who committed a crime as a teen be subjected to life imprisonment without a chance for parole, ever?
With these cases, and another in 2005 where the high court threw out the death penalty for adolescents, I was scientific consultant to the American Psychological Association on its amicus brief. What we said in the death penalty case — and now — was that we have considerable evidence showing that adolescents are different from adults in ways that mitigate their criminal responsibility. But since 2005, there's been a lot of new scientific evidence supporting this position.
Q. WHAT IS THE NEW EVIDENCE?
A. In the last five years, as neuroscience has moved forward with functional magnetic resonance imaging and with research on animals, there have been dozens of new studies of adolescent brain development. These show that the brain systems providing for impulse control are still maturing during adolescence. Neuroscientists have shown that the part of the brain that improves most during adolescence is the prefrontal cortex, which is involved in complicated decision-making, thinking ahead, planning,

comparing risks and rewards. And the neuroscientific research is showing that over the course of adolescence and into the 20s, there is this continued maturation of this part of the brain. So now, we have brain evidence that supports behavioral studies.
Moreover, we're seeing that behavior can change once the brain more fully matures. Take thrill-seeking, for instance. What happens is that when people move out of adolescence, they become less interested in it. For example, I can't stand riding on a roller-coaster now. I liked it as a teenager. I can't stand driving fast now. I liked driving fast when I was a teenager. What has changed? I'm not as driven today by this thrill-seeking sensation. And in our studies, we've shown that there is a kind of normative decline in sensation-seeking after middle adolescence. A lot of adolescent crime is driven by thrill-seeking.
Q. HOW DOES THIS NEW INFORMATION
lead to concluding that the courts shouldn't sentence some adolescents to life in prison without parole?
A. Given the fact that we know that there will be a developmental change in most people, the science says that we should give them a chance to mature out of it. No one is saying that kids who commit horrific crimes shouldn't be punished. But most in the scientific community think that we know that since this person is likely to change, why not revisit this when he's an adult and see what he's like?
Q. DO YOU HAVE TEENAGERS AT HOME?
A. We have a son, Ben, who is now 25 and who works at Random House. He did something as a teenager that led me to a whole program of research. He and some friends went to the window of a girl they knew and inadvertently set off a burglar alarm. When a police squad car came, they panicked and fled. When I found out, I said: "Do you realize that you were running from armed police officers who thought they were interrupting a break-in. What were you thinking?" He said: "Well, that's the problem. I wasn't." I wondered: "What goes on when kids are in a peer group that pushes them to make bad decisions?"
Since then, we've had people of different ages come to the lab and bring two friends with them. We give them computerized risk-taking tests while we image their brains. We compare brain activity when individuals are watched by their friends and when they are alone. For the adults, the presence of friends has no effect. But for adolescents, just having friends nearby doubles the number of risks they take.
We've found that a certain part of the brain is activated by the presence of peers in adolescents, but not in adults.
Q. YOU ADVISED THE DEFENSE TEAM OF OMAR KHADR, THE YOUNGEST DETAINEE AT GUANTáNAMO BAY. WHY GET INVOLVED IN THAT CASE?
A. Because he was 15 when he was captured in a safe house in Afghanistan, where he'd been sent by his father, who was active in Al Qaeda. There was a battle in 2002 to take this house where American troops died.
He was interrogated for many hours and admitted to having thrown a grenade that killed an American soldier. He later recanted. I was asked by his Defense Department counsel to advise on whether what he said during interrogation was reliable and his degree of culpability, if he did do it.
In my deposition, I said I don't know whether he did it or not, but there are studies that say that adolescents are more likely than adults to give false confessions. There's the Central Park jogger case, where it turned out a group of teenagers gave false confessions. Five were convicted. Several years later, an adult murderer and rapist confessed to the crime.
Q. IT HAS JUST BEEN ANNOUNCED THAT YOU'VE WON THIS $1 MILLION KLAUS JACOBS PRIZE. WHAT DO YOU INTEND TO DO WITH THE MONEY?
A. I want to extend our work on adolescent development to teenagers in other cultures so that we can determine whether the patterns are universal. There's a longstanding debate over how much of adolescent behavior is biological or cultural. Perhaps this award will lead to more answers.

http://www.nytimes.com/2009/12/01/science/01conv.html?ref=science

**To Curb Repeat Hospital Stays, Pay Doctors**

By SANDEEP JAUHAR, M.D.

A recent study in The New England Journal of Medicine found that one in five Medicare patients discharged from the hospital was readmitted within a month. One in three was readmitted within three months.

Readmission is costly. In 2004, the cost to Medicare for unplanned readmissions was $17.4 billion — 17 percent of its total hospital budget. And hasty readmission is an indicator of an inefficient, if not dysfunctional, health care system. Many factors contribute to the problem, like poor communication, inadequate discharge instructions, spotty information transfer and delayed outpatient follow-up.

To curb the costs, Congress and the Obama administration are considering bonus payments to hospitals with low readmission rates and penalties on those with high rates. But these incentives are misdirected. Hospitals do not hospitalize patients; doctors do.

And doctors currently stand to gain little from lowering readmissions. In fact, they will lose revenue. As is often the case in our health care system, doctors' incentives do not serve broader social goals. This virtually guarantees that proposed reforms like cutting readmissions, reducing unnecessary tests and adopting computerized medical records will fail.

I encounter this divide nearly every day in my work at a teaching hospital on Long Island. Not long ago, I was charged with helping my hospital reduce the length of stay for patients with congestive heart failure.

My hospital, like all acute-care facilities, receives a set payment per admission based on the patient's diagnosis. So the longer a patient stays in the hospital, the more money the hospital stands to lose. Of course, the longer a patient stays, the greater the likelihood of hospital-acquired infections or harm from tests and procedures, which means timely discharge in most cases is good for hospitals and patients alike.

But doctors, paid separately by Medicare, have little motivation to discharge patients quickly. As long as their patients are in the hospital, they can bill and be paid for each visit they make.

I discussed this issue with an internist in private practice, who requested anonymity because of the sensitive nature of the subject. His patients, it seemed to me, were often staying longer in my hospital than necessary. "I understand why hospitals want to cut down length-of-stay," he told me matter-of-

factly. “But if I discharge a patient early, I don’t get paid. It’s O.K. if you have enough patients in the hospital, but if you don’t, you sometimes have to drag out the stay. I don’t like to do it, but sometimes you have to.”

We talked about how private practitioners often resent hospital intrusion on their decision-making authority. “Some doctors get so mad at the hospital, but I don’t because I realize it is just business,” he said. “It has nothing to do with patient care. It’s about money, pure and simple.”

The irony is that the pressure to reduce length-of-stay has probably increased readmission rates due to premature discharges. According to the New England Journal paper, 30-day Medicare readmission rates have risen nearly 50 percent over the past three decades.

There are many things doctors could do to reduce readmission rates. They could ensure patients have timely medical follow-up. (In the New England Journal study, half of all medical patients readmitted within 30 days did not visit a doctor after discharge.) They could do a better job ensuring that patients obtained their medications and understood how to take them. But research shows inconsistency at best in achieving these goals.

You have to motivate doctors to do the right thing. You can appeal to professionalism or altruism, to doing well for patients or serving a greater social purpose, but nothing influences behavior like money, especially in these times.

The Center for Medicare and Medicaid Services is considering giving bonuses to hospitals for lowering readmission rates. I believe some of that money should be shared with doctors. Current law prohibits hospitals from paying doctors for reducing hospital services, even if the goal is to provide more efficient care. But such “gainsharing” will align doctors’ incentives with broader cost-cutting goals. Our system needs to provide inducements to decrease the amount of health care, especially with the current incentives that encourage rampant overutilization.

In July, C.M.S. announced a gainsharing demonstration project at 12 New Jersey hospitals, which will offer doctors financial rewards for helping the hospitals improve efficiency and lower costs by reducing length-of-stay, improving discharge planning and so on. There are safeguards in the program to ensure that quality of care does not suffer.

In an interview, Betsy Ryan, president and chief executive of the New Jersey Hospital Association, said, “Gainsharing is an innovative way to bend the cost curve.”

This project, I believe, is a step in the right direction. Unless doctors view cost-cutting goals as their own, policy makers don’t stand a chance of achieving them.

So I offer this prescription to Congress and the Obama administration: Share the savings, and you will see them grow. Otherwise, any effort to lower Medicare spending is bound to be futile. It is easy to say that doctors should adhere to higher moral standards, but it is naïve to think that money cannot or should not be used to influence their decisions.

*Dr. Sandeep Jauhar is a cardiologist on Long Island and the author of the recent memoir, “Intern: A Doctor’s Initiation.”*

http://www.nytimes.com/2009/12/01/health/01essay.html?ref=science

**Foetal blood vessel failure clue**

**Scientists have made a breakthrough in understanding why a foetal blood vessel can fail to close shortly after birth, causing serious health problems.**

If the ductus arteriosus fails to close babies develop high blood pressure in the lungs and heart failure.

A German team showed that platelets, cells in the blood which form clots, play a key role in closing the vessel.

The study, by researchers at Munich's Technischen University, appears in the journal Nature Medicine.

The ductus arteriosus is a short vessel which connects the pulmonary artery to the aorta, allowing most of the blood from the right ventricle of the heart to bypass the foetus's fluid-filled lungs.

" **A better understanding of how the ductus arteriosus closes just after birth could help the treatment of very vulnerable babies, and potentially save lives** "
Professor Jeremy Pearson British Heart Foundation

This protects the lungs from being overworked and allows the left ventricle of the heart to strengthen.

However, once development is complete, the vessel's work is done and it usually closes in the hours after birth.

But how this process takes place has been unclear and sometimes it does not happen, causing a condition known as patent ductus arteriosus.

This is a particular risk in premature babies with a low birth weight.

If left uncorrected this can lead to a build up of pressure in the blood vessels of the lung, which can trigger shortness of breath and dizziness.

Ultimately, it can lead to irregular heart rhythms and congestive heart failure.

Working on mice, the Munich team found that platelets congregate at the ductus arteriosus during closure, promoting the formation of a clot as the vessel contracts.

They showed that in mice with defective platelet function, the ductus arteriosus failed to close.

This resulted in a condition similar to that found in the human disease: increased blood flow in the lung and excessive growth of the right ventricle of the heart.

**Transfusion possibility**

The researchers also showed, in a clinical study in premature babies, that not having enough platelets in the blood was associated with a failure of the ductus arteriosus to close.

Lead researcher Dr Steffen Massberg said: "Our study might might lead to a change of the current treatment strategies to prevent failure of ductus arteriosus closure, particularly in preterm newborns with low platelet counts.

"It is conceivable that transfusion of platelets reduces the risk of ductus arteriosus patency (lack of closure) in preterm newborns with low platelet count."

Professor Jeremy Pearson, of the British Heart Foundation, said: "This breakthrough is really promising as a better understanding of how the ductus arteriosus closes just after birth could help the treatment of very vulnerable babies, and potentially save lives."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8390868.stm

Published: 2009/12/07 00:01:53 GMT

**Mass cannibalism clues uncovered**
By Victoria Gill
Science reporter, BBC News

**Archaeologists have found evidence of mass cannibalism at a 7,000-year-old human burial site in south-west Germany, the journal Antiquity reports.**


The authors say their findings provide rare evidence of cannibalism in Europe's early Neolithic period.

Up to 500 human remains unearthed near the village of Herxheim may have been cannibalised.

The "intentionally mutilated" remains included children and even unborn babies, the researchers say.

The German site was first excavated in 1996 and then explored again between 2005 and 2008.

Team leader Bruno Boulestin, from the University of Bordeaux in France, told BBC News that he and his colleagues had found evidence the human bones were deliberately cut and broken - an indication of cannibalism.

"We see patterns on the bones of animals indicating that they have been spit-roasted," he said. "We have seen some of these same patterns on the human bones [at this site]."

But Dr Boulestin stressed it was difficult to prove that these bones had been deliberately cooked.

Some scientists have rejected the cannibalism theory, suggesting that the removal of flesh could have been part of a burial ritual.

But Dr Boulestin said the human remains had been "intentionally mutilated" and that there was evidence many of them had been chewed.

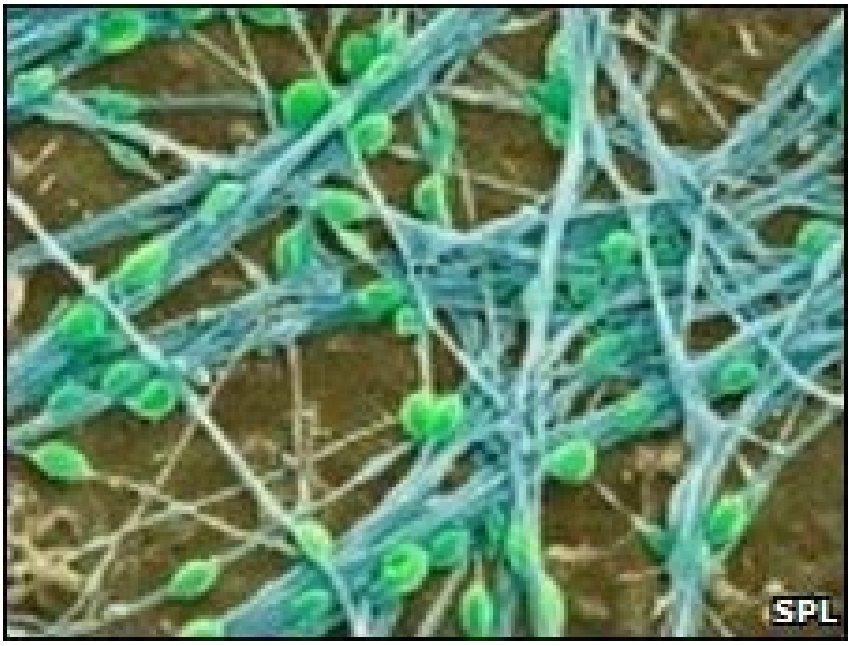
The early Neolithic was the period when farming first spread in central Europe and the team believes that cannibalism in Europe was likely to have been exceptional - possibly carried out during periods of famine.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8394802.stm

Published: 2009/12/06 07:34:36 GMT

**Clue to 'drug-resistant' epilepsy**

**Experts believe they have uncovered the root cause of "stubborn" epilepsy that fails to respond to drug treatment.**




Tests on patients' brain tissue revealed some seizures are caused by electrical connections between nerve cells rather than chemical ones.

This faulty wiring would explain why traditional drugs are useless and why some patients have to resort to surgery, say the UK researchers.

Their work appears in Proceedings of the National Academy of Sciences.

Dr Mark Cunningham and his team at Newcastle University hope the findings will open the door to new treatments for the condition which affects an estimated 45 million people worldwide.

In almost 30% of epilepsy patients drug treatment fails and some resort to surgery to remove the brain tissue responsible for the condition.

**Brain signals**

The researchers took brain tissue removed from people with epilepsy and in the lab were able to coax it to behave as if it was still part of the living brain.

They were then able to record electrical signals from individual neurons and networks of neurons in the samples.

" **We hope that this research will move us closer to effective treatment for more people with epilepsy in future** "
Simon Wigglesworth of Epilepsy Action

Comparing this with normal brain tissue activity, they managed to record an underlying 'noise' - a particular type of brain wave, or oscillation, which occurs in the intact epileptic human brain and which scientists believe is a precursor to an epileptic seizure.

They then found that rather than being controlled by chemical signals which most conventional anti-epileptic drugs target, this oscillation relies on direct electrical connections.

Dr Cunningham said the next step would be to understand what it is that triggers the transition between the underlying epileptic state of the brain cells and the fast oscillations that are responsible for causing a seizure.

Simon Wigglesworth of Epilepsy Action said: "This is exciting news for people whose epilepsy cannot be controlled by medication and an important development in our understanding of the condition.

"Currently, there is no treatment to cure epilepsy other than surgery, which at the moment is only effective for small numbers.

"We hope that this research will move us closer to effective treatment".

A spokeswoman for Epilepsy Research UK described the research as "very promising".

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8385790.stm

Published: 2009/12/07 10:42:53 GMT

**Gene flaw 'causes child obesity'**

**Scientists have discovered what they believe is a genetic cause of severe obesity in children.**


The team concluded that the loss of a key segment of DNA can be to blame.

It said the findings might improve diagnosis of severe obesity - which on occasion has been wrongly attributed to abusive overfeeding.

The study, of 300 children with severe obesity by the University of Cambridge and the Wellcome Trust Sanger Institute, appears in Nature.

Some of the children in the study had been formally placed on the social services 'at risk' register on the assumption that their parents were deliberately overfeeding them. They have now been removed from the register.

" **We hope that this will alter attitudes and practices amongst those with professional responsibility for the health and well-being of children** "
Dr Sadaf Farooqi University of Cambridge

Obesity is increasing throughout the world and is recognised as a major global public health concern.

Although much of the problem is due to lifestyle factors such as an unhealthy diet, and lack of exercise, some cases are thought to be down to genetics.

The latest study examined each child's entire genome, looking for deletions or duplications of DNA, known as copy number variants (CNVs).

Experts increasingly believe these CNVs play an important role in genetic disease.

**Genome scan**

By comparing the DNA profile of obese children with others of a normal weight they found certain parts of the genome were missing in the obese group.

In particular they zeroed in on a missing part of chromosome 16 which seemed to have a strong link to severe obesity.

Researcher Dr Sadaf Farooqi said: "Our results suggest that one particular gene on chromosome 16 called SH2B1 plays a key role in regulating weight and also in handling blood sugar levels.

"People with deletions involving this gene had a strong drive to eat and gained weight very easily.

"It adds to the growing weight of evidence that a wide range of genetic variants can produce a strong drive to eat.

"We hope that this will alter attitudes and practices amongst those with professional responsibility for the health and well-being of children."

Dr Matt Hurles, who also worked on the study, said: "This is the first evidence that copy number variants have been linked to a metabolic condition such as obesity.

"They are already known to cause other disorders such as autism and learning difficulties."

Dr Ian Campbell, medical director of the charity Weight Concern, stressed most children did not have significant genetic factors that predisposed them to obesity, and that lifestyle, diet and exercise remained important.

But he added that the causes of obesity - and the potential solutions - were complex.

He said: "The fact that several of the study children have been taken out of social care and returned to their parents as a result is disturbing in itself and must surely put an end to the claims by some that childhood obesity is a simple case of parental abuse.

"It clearly isn't. These families need our support."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8394991.stm

Published: 2009/12/06 18:35:16 GMT

**Lower birth weight puberty link**

**Further evidence has emerged that babies who are small at birth are more likely to start puberty early.**


Rapid weight gain in the first two years of life is also associated with earlier onset of puberty, the American Journal of Clinical Nutrition reports.

The reason for the link, which was apparent in boys and girls, is not yet clear, the German researchers said.

Early puberty has been associated with an increased risk of breast and testicular cancer.

It has also been linked to other hormonal changes that could play a role in cancer's development.

" **Until more research is done, the best advice for parents is to give their children a healthy start in life by encouraging them to get into the habit of eating a healthy plant-based diet, be physically active and maintain a healthy weight** "
Dr Panagiota Mitrou, WCRF

The World Cancer Research Fund who backed the study said better understanding of factors early in life which increase future risk of cancer could potentially help develop strategies to prevent the disease in the first place.

It is not the first time factors such as low birth weight have been linked with early puberty.

But previous studies have focused solely on girls and used first period as a measure of the start of puberty.

In the latest study, researchers looked at a sample of 215 boys and girls who had height and weight measured regularly from birth to early adulthood.

They calculated when children had the growth spurt that pre-empts puberty.

Those born at 2.5kg-3kg (5.5lbs-6.6lbs) started puberty seven months earlier than heavier babies.

And those who grew fastest as infants tended to have their puberty growth spurt four months earlier.

The study did also show that for girls, rapid early weight gain was also related to starting their periods earlier.

**Mechanism**

Study leader Professor Anja Kroke said: "More studies are now needed to identify the physiological mechanisms by which a low birth weight and rapid early weight gain affect the timing of the pubertal growth spurt.

"In addition, by gaining a better understanding of why early puberty increases cancer risk, we can improve our understanding of the causes of cancer, and therefore raises the possibility of preventing future cancer cases."

Dr Panagiota Mitrou, science programme manager for the WCRF, said: "This study shows that what happens to us even in the womb can influence risk factors for diseases much later in life.

"Until more research is done, the best advice for parents is to give their children a healthy start in life by encouraging them to get into the habit of eating a healthy plant-based diet, be physically active and maintain a healthy weight."

Professor Fran Ebling, an expert in regulation of puberty and weight at the University of Nottingham, said these sorts of studies were very hard to do so the results were very impressive.

"This points to what we had thought - that babies who are born smaller and who put on weight more rapidly start puberty earlier.

"But what is controversial is they don't find a link between birth weight, early puberty and childhood obesity - and there are other studies that have found that."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8395008.stm

Published: 2009/12/05 01:51:36 GMT

**Worm could offer Parkinson's clue**

**Scientists believe that worms could hold the key to why some people develop Parkinson's Disease.**

Worms share 50% of their genes with humans, including those involved with inherited Parkinson's.

Dundee University researchers will study a simple worm called C. elegans to try to work out why the condition causes patient's brain cells to die.

The Parkinson's Disease Society has given the university £190,000 to carry out the research.

**Eventual cure**

There are about 120,000 people with Parkinson's in the UK. In up to 5% of those cases, the disease is believed to be directly inherited.

Parkinson's is a progressive neurological condition affecting movements such as walking, talking and writing. It occurs as a result of a loss of nerve cells in the brain.

Dr Anton Gartner, who is leading the study, said: "Research leading to an eventual cure for Parkinson' s disease is a daunting task and requires a very broad and multidisciplinary approach.

"I am grateful to the Parkinson's society to recognise this and to so generously support our research."

" **It's fascinating that such a simple animal as a worm can be an excellent model for Parkinson's researchers** "
Dr Kieran Breen Parkinson's Disease Society

Worms will be used in the study as they are one of the simplest organisms with a nervous system.

The way worms' nerve cells communicate with each other is also similar to how it works in humans.

Several genes, including one known as LRRK2, have been linked to the hereditary form of Parkinson's Disease.

Dr Gartner's team want to understand how changes or mutations in this gene lead to the development of Parkinson's - and how drugs could stop the damage that these mutations cause to nerve cells.

Dr Kieran Breen, from the Parkinson's Disease Society, said: "It's fascinating that such a simple animal as a worm can be an excellent model for Parkinson's researchers to study what happens in specific nerve cells.

"We are delighted to be funding this research with Dr Gartner in Dundee. It will help us to understand better what causes nerve cells to die in Parkinson's, and will help us to develop new treatments for the condition."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/uk_news/scotland/tayside_and_central/8396112.stm

Published: 2009/12/05 00:49:48 GMT

**Study measures ocean's CO2 uptake**

By Mark Kinver
Science and environment reporter, BBC News

**There are substantial variations in the amount of carbon being absorbed by the North Atlantic Ocean, a study shows.**


Writing in Science, an international team of researchers said the ocean's uptake of carbon varied by as much as 10% over the space of a few years.

The data set, described as the largest of its kind, was gathered by devices fitted to a fleet of commercial ships.

The world's oceans are believed to absorb about half of the total carbon emissions from human activities.

"Out of all the carbon dioxide released into the atmosphere, about half of it does not stay there," said lead author Andrew Watson, a researcher from the University of East Anglia's School of Environmental Sciences.

"It is taken up by the natural world; half of it is absorbed on land, and half of it ends up in the oceans."

In the carbon cycle, natural fluxes are the biggest, accounting for about 330 gigatonnes per year, and are in near equilibrium

The roughly 7.5 gigatonnes coming from all human sources may be sufficient to tip this system out of balance, warming the Earth

Professor Watson said that it had been assumed that the amount of CO2 absorbed by the oceans remained constant.

"What we seem to be seeing is that it appears to be changing over a period of several years," he told BBC News.

"We are talking about a variability (in the North Atlantic Ocean) that is in the order of about 0.2bn tonnes of carbon each year.

"Over a few years, the uptake is changing by at least 3% of the total production of CO2 by all human activities."

**Ocean mapping**

Professor Watson explained that climate modellers had attempted to assess how much variability there was in the overall carbon cycle.

"They had some difficulty because they simply did not have a sufficient amount of basic data," he said.

Writing in the paper, the international team of researchers said that they overcame the historical problem of sparse observations by using a network of commercial vessels.

"We began this work in the mid-90s when we fitted one automated device," Professor Watson recalled.

"We then realised that if we got a few devices to cover a large region, we could map an ocean with this technique."

Researchers from a number of nations, including Spain, Denmark and the UK, established a co-ordinated network in 2005 that placed the instruments on volunteer observing ships (VOS) that made regular journeys across the Atlantic.

Climate models suggest that carbon sinks will weaken over time as the climate changes, and Professor Watson hopes his team's research will shed light on the dynamics of ocean sinks.

"It is important because the natural system takes up so much carbon, and we do have a suspicion that this uptake will change," he commented.

"Some people are quite nervous about that."

He added that the monitoring system developed by the team could be rolled out in other regions.

"We don't know what is happening elsewhere because we do not have the network in place.

"We could not cover all of the world's oceans because there are not many vessels in the Southern Ocean, for example.

But he said that there was enough traffic across the North Pacific and South Atlantic to establish feasible networks.

"It would be relatively cheap and it would be a huge advance in our understanding of the carbon cycle and where carbon is going."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/in_depth/sci_tech/green_room/8390388.stm

Published: 2009/12/04 14:20:50 GMT

**Mobiles 'not causing brain risk'**

**There has been no substantial change in the number of adult brain tumours since mobile phone usage sharply increased in the mid-1990s, Danish scientists say.**

The Danish Cancer Society looked at the rates of brain tumours among 20 to 79 year olds from Denmark, Finland, Norway and Sweden.

They found that trends in cancer rates had not altered from the period before mobiles were introduced.

But they say longer follow-up studies are needed.

The research, published in the Journal of the National Cancer Institute, says radio frequency electromagnetic fields emitted from mobile phones have been proposed as a risk factor for brain tumours, but a biological mechanism that could explain the potential effects has not been identified.

**Cancer incidence**

The study was based on 59,684 brain tumour cases diagnosed over 30 years from 1974 to 2003 among 16 million adults.

" **B rain tumours often take a very long time to develop so we will need to look for any future changes in incidence rates to see if mobile phones could pose any longer-term risks** "
Dr Alison Ross, Cancer Research UK

During this time, the incidence rate of cancers known as gliomas increased gradually by 0.5% per year among men and by 0.2% per year among women.

For cancers known as meningioma, the incidence rate increased by 0.8% among men and, after the early 1990's, by 3.8% among women.

This more rapid change for women was driven, the researchers say, by the 60-79 year age group.

Isabelle Deltour, of the Danish Cancer Society in Copenhagen who led the study said the lack of a detectable increase in tumour rates up to 2003 may suggest that the time it takes for cancer to develop from mobile phone use is longer than 10 years of exposure or that the number of tumours it promotes is too small to be detected.

She said: "Our results extend those of previous studies of time trends up to 1998 by adding five years of follow-up.

"Because of the high prevalence of mobile phone exposure in this population and worldwide, longer follow-up of time trends in brain tumour incidence is warranted."

**Further research**

Dr Alison Ross, Cancer Research UK's senior science information officer, agreed that further research was needed: "Overall, the scientific evidence tells us that using mobile phones for less than 10 years does not increase the risk of cancer and this large study supports that conclusion.

"However, brain tumours often take a very long time to develop so we will need to look for any future changes in incidence rates to see if mobile phones could pose any longer-term risks."

Mike Dolan, of the Mobile Operators Association which represents all five UK network operators said: "This finding is consistent with previous studies in this field and will form part of the overall body of scientific research.

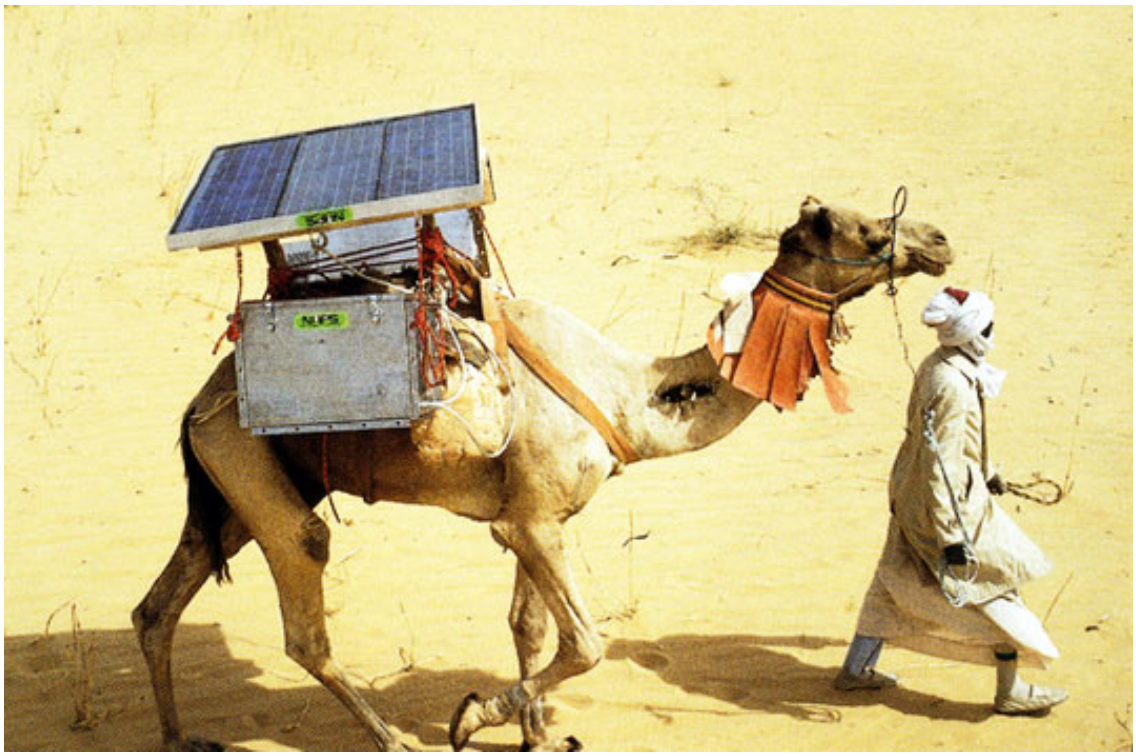
"The UK mobile phone operators are supporting a large cohort study which is a recommendation of this paper."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8393884.stm

Published: 2009/12/04 03:00:29 GMT

**Solar-Powered Camel Clinics Carry Medicine Across the Desert**

by Sarah Parsons, 12/01/09



Kenya's camels recently started sporting some unusual apparel: eco-friendly refrigerators! Some of the African country's camels are carrying the solar-powered mini fridges on their backs as part of a test project that uses camels as mobile health clinics. Organizers hope the eco-friendly transport system will provide a cheap, reliable way of getting much-needed medicines and vaccines to rural communities in Kenya and Ethiopia.

For the past decade, Nomadic Communities Trust has been using camels as mobile health clinics in Kenya's Laikipia and Samburu districts, isolated areas with few roadways. While the camel convoys provide a cost-effective method of traversing the harsh terrain, the group had no way of delivering medicines and vaccines that required refrigeration — until now. In 2005, Nomadic Communities Trust partnered with California's Art Center College of Design's Designmatters and Princeton's Institute for the Science and Technology of Materials (PRISM). Together, the groups created a lightweight and durable solar-powered refrigerator that can be strapped to camels' backs in order to transport chilled medicines and vaccines.

The mini fridge is housed in a bamboo saddle that is lightweight and durable enough for camels to easily carry it across miles of rough terrain. The device itself is covered with crystalline solar panels that provide power for the compartmented fridge's generator. The solar panels themselves can also be used by the mobile clinics for lighting and refrigeration in the field.

Mariana Amatullo, Designmatters' executive director, said the project was designed with a budget of only a few thousand dollars. To save money, designers tested the device on the Bronx Zoo's camels so people wouldn't have to fly back and forth to Kenya.

The solar-powered fridges are currently being tested on camels in Kenya and Ethiopia, but Amatullo says the system could be used by any rural communities with access to camels. If the project secures enough funding, it will be implemented in earnest in 2010. Let's hope the eco-friendly venture receives the money it needs — in the Laikipia and Samburu districts alone, 300,000 people do not have access to the mobile health clinics.

+ Nomadic Communities Trust

+ Designmatters

+ PRISM

Via Ecofriend.org

http://www.inhabitat.com/2009/12/01/solar-powered-camel-clinics-carry-medicine-across-the-desert/?utm_source=Inhabitat+Weekly&utm_campaign=cdccdc1e1e-Inhabitat_Weekly_November_19th11_12_2009&utm_medium=email

***CONCRETE CLOTH: Flexible Material Makes Durable Disaster Shelters***

by Ariel Schwartz, 11/30/09

When a disaster strikes, it's often difficult to get shelters up in time for displaced residents. Enter Concrete Canvas's new Concrete Cloth, a durable waterproof building material made of cement sandwiched between fabric. The cloth, which won Material ConneXion's Material of the Year 2009 award, can be molded into any shape when bonded with water — and it takes just two hours to set!

Perhaps the most useful application for Concrete Cloth is in disaster relief, where the material could be used to quickly and efficiently house both people and food. Since the cloth has a life span of 10 years, it can be used in situations where displacement is prolonged. Concrete Cloth's durability also makes it ideal for military use.

There's just one drawback to Concrete Cloth: the material contains PVC, a plastic that leaches toxic chemicals. If Concrete Canvas could figure out a way to replace PVC with something else, we'd love to see Concrete Cloth used around the world.

+ Concrete Cloth

Via Dezeen

http://www.inhabitat.com/2009/11/30/concrete-cloth-flexible-material-makes-durable-disaster-shelters/?utm_source=Inhabitat+Weekly&utm_campaign=cdccdc1e1e-Inhabitat_Weekly_November_19th11_12_2009&utm_medium=email

**Print: Applying Quantitative Analysis to Classic Lit**

- By Douglas McGray
- Wired Dec 2009

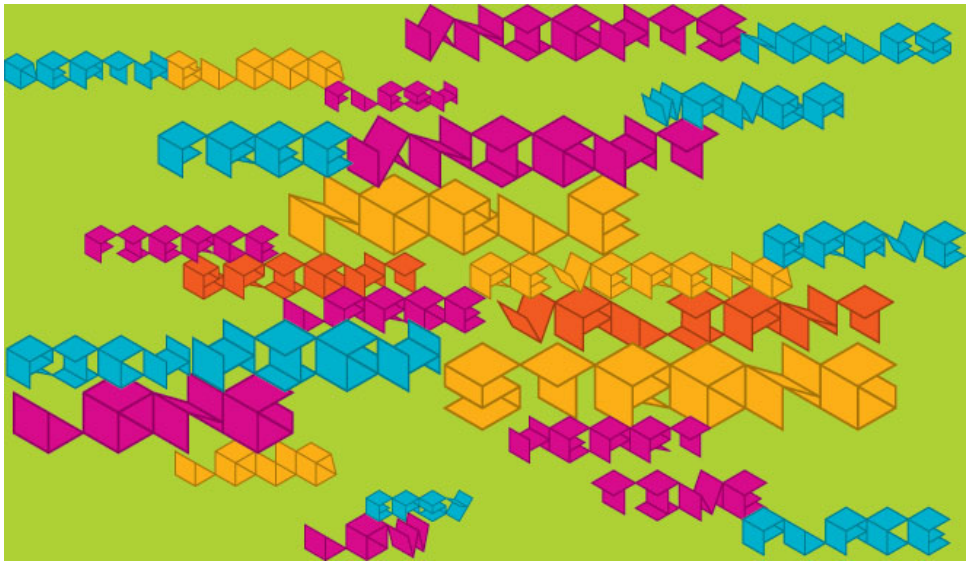


Illustration: Rodrigo Fuenzalida

If Google has its way, all of English literature will one day exist as searchable digital text. Franco Moretti, a Stanford English professor, wants to be ready for the deluge with new kinds of questions and new tools to answer them — things like computational linguistics, data mining, computer modeling, and network theory. Moretti is already famous in bookish circles for his data-centric approach to novels, which he graphs, maps, and charts. Until recently, though, he's been able to crunch only a few novels at a time, doing all that quantitative stuff by hand. Now he's going digital, building searchable databases of old books, working to write software that can mine for patterns. Instead of diving deep into a few beloved titles, Moretti aims to zip across the creative output of entire eras. He calls it distant reading, and if his new methods catch on, they could change the way we look at literary history.Take one experiment. Moretti decided to test the idea that Victorian writers, through their choice of adjectives, might reveal their belief that moral qualities were indivisible from reality itself and that physical traits reflected a person's virtue. So he assembled a database of 250 novels and sent the file to computer scientists at IBM's Visual Communications Lab, who turned the books into a series of word clouds. "Boom! There were exactly the adjectives I had hoped would pop up!" he says. "Adjectives like *strong*, *bright*, *fair*, in which the physical and the moral blend."For another project, he looked at the titles of 7,000 books in 18th- and 19th-century England and discovered a correlation between shorter titles and the growth of the book publishing industry. (Moretti theorizes that more concise titles made books easier to promote in a crowded marketplace.) He is also working with a programmer to test new software that can "read" terabytes of obscure, mostly unread fiction and classify the books by genre."In 19th-century Britain, maybe 30,000 novels were published," Moretti says. He is dying to analyze them all. It will be like peering through the first telescope, he says — surveying more literature at a glance than he could read in a lifetime. "We will get a sense," he says, "of a much wider universe."

http://www.wired.com/magazine/2009/11/pl_print?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+wired%2Findex+%28Wired%3A+Index+3+%28Top+Stories+2%29%29&utm_content=Google+Reader

**A Rembrandt Identity Crisis**
**By JORI FINKEL**

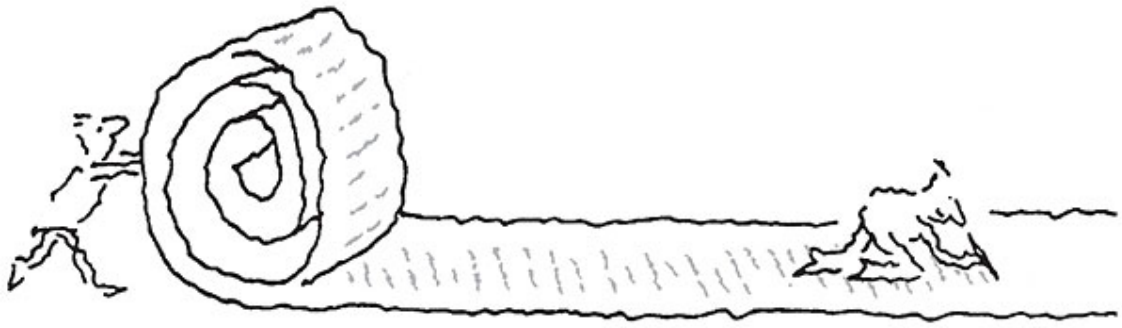
REMBRANDT'S studio in Amsterdam was one of the biggest and busiest art enterprises of the 17th century, drawing dozens of pupils and charging serious tuition fees. But it was not, in some respects, the most organized. Scholars suspect that drawings by Rembrandt's pupils were routinely mixed in with their teacher's work in albums that entered the marketplace.

For the last three centuries, and especially the last three decades, art historians have been trying to sort out this mess, working to distinguish master from apprentice. By some counts a good three out of four drawings once believed to be by Rembrandt were actually done by his students.
The new exhibition at the Getty Museum in Los Angeles, "Drawings by Rembrandt and His Pupils," lets viewers try their hands at determining authorship themselves by showcasing 43 drawings by Rembrandt paired with similarly themed work by his strongest students from the 1630s to the '60s. Of the pupils' drawings in the show, over half were once thought to be by Rembrandt himself.
The show grew out of research by Peter Schatborn, former head of the prints and drawings collection at the Rijksmuseum in Amsterdam, who proposed new attributions for some so-called Rembrandt nudes in a 1987 talk at Harvard. Seventeen years and many catalog essays later, he gave a much-expanded version of the lecture at the Getty, where the museum's drawings curator, Lee Hendrix, saw "the room catch on fire" with questions and comments. She also saw the kernel of an exhibition and invited Mr. Schatborn to work with her as a guest curator.
In addition to poor file keeping, there are other reasons for the confusion between Rembrandt's work and his students', starting with the practice, popular at the time, of students learning through imitation. Also, because these sketches were generally made as exercises and were not intended for sale, it is rare to find a signature. And then there's the wishful thinking of dealers and collectors, as the market generously rewards a Rembrandt attribution while often devaluing a "school of" work.
But recent generations of Rembrandt scholars have worked to set the record straight. They don't always agree on the details, but they share a basic methodology. Only 75 or so Rembrandt drawings can be safely attributed to him based on, say, a signature or direct relationship to signed paintings. The attributions of all other drawings, then, depend on detailed comparisons with the known quantities.
The exhibition curators have applied a similar approach to Rembrandt's pupils. Mr. Schatborn has, for example, reattributed the drawing on the right to Rembrandt's skilled apprentice Arent de Gelder, noticing that the model's ear resembles ears in a known work by de Gelder. (This "Seated Nude," from around 1660, belongs to the Museum Boijmans Van Beuningen in Rotterdam, the Netherlands; Rembrandt's version, at left, comes from the Art Institute of Chicago.)
Mr. Schatborn also did some basic sleuthing, surmising that it would have been extremely odd for any artist to draw the same model in the same pose from two different vantage points. But most of all he engaged in old-fashioned formal analysis to distinguish between the two nudes. "It's very interesting," he said, "how a Rembrandt becomes more of a Rembrandt when compared to a drawing that is so similar."

http://www.nytimes.com/2009/12/06/arts/design/06rembrandt.html?_r=1&ref=design

**The Illustrator**

**By SARAH BOXER**



An unreliable narrator — everyone knows what that is. But an unreliable letter writer? “Unreliable” not in that he doesn’t write, or takes too long to answer letters, but in that you don’t know how far to believe him. Are the dates on his letters right? Is his advice sincere? Is he actually writing a letter at all?

R. O. Blechman is an illustrator with a notably tremulous line; he is also a filmmaker. He drew the book “The Juggler of Our Lady” in 1953. His 1967 commercial for Alka-Seltzer, in which a troubled stomach sits in a modernist swivel chair arguing with his host about the gut-wrenching foods his host eats, is in a class of its own.

This R. O., whose R stands for Robert and O for Oscar, is now the author of DEAR JAMES: Letters to a Young Illustrator (Simon & Schuster, $21). The letters are plain-spoken, charming and earnest. But Blechman is not the letter writer he first appears to be, for as he notes at the end of his book, his pen pal, James Wetherington, who signs his drawings “Jaz” and who has a snoring girlfriend and a younger brother contemplating art school, “is a figment of my imagination.”

Then whom did Blechman imagine writing to? And when? He dates the letters 1984, but in one he mentions that his son Nicholas is an art director, which happened over a decade later (Nicholas Blechman is now the art director of the Book Review). In another he shows an illustration from 2007. His likeliest imaginary pen pal is the cartoonist Nurit Karlin, who was once his student.

After all, it’s her drawings (the ones signed Jaz) that he comments on. (The book also has drawings by Saul Steinberg, Peter Arno, William Gropper and Blechman himself.) But why not say so? Because these letters weren’t written for Karlin or anyone, but rather composed as a book at the suggestion of his other son, Max: “Why don’t you write something like Rilke’s ‘Letters to a Young Poet,’ but for illustrators?”

“Dear James” is, thankfully, nothing like Rilke’s book. Where Rilke, whom Blechman calls “that ultimate dandy,” constantly urges his pen pal poet to look “deep within” and shun outside opinion, Blechman advises young James to “meet people” and take all graphic work that comes his way: “I look forward to your next letter — and I want it written on Young & Rubicam letterhead.” Funny.

Blechman pooh-poohs the Rilkean test “Ask yourself in the most silent hour of your night: Must I write?” and counters it by reeling off a list of artists who didn’t give up their day jobs: Wallace Stevens, William Carlos Williams, Anton Chekhov, Peter Paul Rubens.

Yes, even the liveliest spirit, Blechman says, can be killed by “the grinding anxiety of worrying about when you’ll see your next check.”

Or by the grinding anxiety of freedom. After the Renaissance but before the mid-1950s, Blechman notes, illustration was almost always handmaiden to the text. Then "a new word entered the vocabulary of commercial art" — "concept," which brought its own set of hits and misses: "We had become so many Charlie Parkers." Or would-be Charlie Parkers. (Did you know that Blechman almost collaborated on an animated film about Parker with the Rolling Stones' drummer, Charlie Watts?)

It's tough work starting your own engine without an external push, and Blechman tells how other gentlemen have done it: by stroking red velvet (Wagner), "dipping feet into hot water (Turgenev), drinking noxious quantities of black coffee (Balzac) and smelling rotten apples (Schiller)."

What's Blechman's poison prod? Boundaries. Tight deadlines. Little spaces. Before he does a spot drawing for a newspaper, he photocopies the whole page, leaving a blank space for his drawing. He likes the push and pull of terrible constraints.

And he says he's strangely attracted to Dr. Doolittle's pushmi-pullyu. That may explain why he wrote this book as a series of letters, even though nobody was at the other end. To push himself to write, he needed another half to pull. Or, in the language of Alka-Seltzer, if a man has no stomach to bicker with, where then will he get all that lovely heartburn?

http://www.nytimes.com/2009/12/06/books/review/Boxer-t.html?ref=design

**Photography**
**By JENNIFER BASZILE**

Whether the lashed back of an enslaved person, the charred remains of a lynching victim or a terrified marcher fleeing a fire hose, shocking images of degradation seem to dominate the visual history of the African-American experience. Amid so much hardship, one might wonder what, if anything, to say about the nature of black beauty in photography. Deborah Willis, head of New York University's photography and imaging department, spent a decade exploring the question. In POSING BEAUTY: African American Images From the 1890s to the Present (Norton, $49.95), Willis makes a monumental contribution to contemporary American culture by presenting a definitive history of black beauty.

The book's title captures the defining duality of posing: "positioning the subject and questioning the trappings of beauty." Willis avoids monolithic definitions, and the more than 200 duotone and color photographs capture nearly every African-American skin tone, hair texture and body type. Willis also leads readers through a careful yet broad survey of beauty in every decade since the 1890s. On every page, she tracks changing social, political and aesthetic contexts, but she never allows them to overwhelm the subjects or photographers.
"Posing Beauty" contains revealing photographs of American icons like Madame C. J. Walker, W. E. B. Du Bois, Josephine Baker, James Brown, Angela Davis, Malcolm X, Serena Williams, and Michelle and Barack Obama. Many well-known figures appear outside their usual context — Miles Davis is pictured standing in front of his closet. Condoleezza Rice smiles broadly as she holds a football helmet. These unexpected images offer fascinating meditations on the centrality of beauty to each celebrity's power. Willis also presents equally striking photographs of waitresses, children on Easter morning and others in the midst of everyday life. The longstanding celebration of black beauty in festivals, pageants and contests might surprise, and even trouble, some readers. The throngs of people who assembled in the 1920s to observe the Pacific Beach Beach Club Beauty Contest probably never imagined they would be captured in the panoramic photograph that marks the event along with the beauty queens in the

foreground. If a single thread unifies the images in this amazing collection, it is the subjects' agency in the conception and presentation of their own beauty, which is itself a radical departure from the more familiar objectification of African-Americans in the nation's collective visual memory.
The photographers whose works populate this collection are also as diverse as the subjects they capture. Gordon Parks, Walker Evans, Carl Van Vechten, Charles (Teenie) Harris, Anthony Barboza and Annie Leibovitz create evocative works that convey the complexity and scope of black beauty. Carrie Mae Weems's 2006 self-portrait, entitled "I Looked and Looked to See What So Terrified You," provides one of the most arresting reflections on the relationship between subject, photographer and viewer.
With "Posing Beauty," Willis has forever changed the conversation about beauty in American life. After centuries of exclusion and segregation in which African-American beauty existed on the margins of the culture, Willis offers readers a thoughtful and nuanced consideration of the relationship of beauty and power. She invites us to marvel at the glamour and elegance contained in the photographs, and in the process instructs us on how to expand the definition of beauty within our national imagination.
In the pages of "Posing Beauty," readers can appreciate African-American men and women as dandies and debutantes, models and beauty queens, politicians and clubwomen across the generations. The book is a treasure, a triumph and a singular achievement that invites fresh and enduring insights with each viewing.

http://www.nytimes.com/2009/12/06/books/review/Baszile-t.html?ref=design

**Paris**
**By CAROLINE WEBER**

In his 1781 “Picture of Paris,” the left-leaning journalist Louis--Sébastien Mercier lamented, “Ah, if Louis XIV had spent in Paris a mere quarter of the costs of Versailles, Paris would have been the most astonishing city in the entire universe.” On the eve of the monarchy’s fall, Mercier’s complaint resonated with the zeitgeist. But in hindsight it rings hollow, because as astonishing cities go, Paris could give any place in the universe a run for its money. And this is in no small part due to Louis XIV (whose contributions to the capital include the Champs-Élysées, the Invalides and the Tuileries) and his predecessors and successors. From the Capetian kings’ Cathedral of Notre-Dame to François Mitterrand’s I. M. Pei pyramids, the landmarks of Paris have always functioned to express and enhance their sponsors’ stature.Indeed, as the historian Georges Duby notes in his preface to the gorgeously illustrated, brilliantly curated HISTORY OF PARIS IN PAINTING (Abbeville, $235), which he has edited with Guy Lobrichon, Paris’s manifold architectural charms are best understood as manifestations of a political will to power. “The city,” Duby writes, “must be monumental, a great theater set where sovereignty is revealed through . . . avenues, public squares, palaces, basilicas and fountains. In Paris, this theater became exceptionally sumptuous as each government that adopted the city as its capital made a concerted effort to outdo its predecessors.” The resulting cityscape “forcefully evokes the memory of the dramas of public life that have played out on its vast stage at the nation’s center.”The genius of “The History of Paris in Painting” is, accordingly, to concentrate on the intense interplay between aesthetics and politics from which the city has, under each of its many political regimes, emerged transformed. Ever since the popularization of easel painting in Paris in the 14th century, artists have compiled an unparalleled record of the city’s metamorphoses — a record this volume reproduces in abundant and captivating detail. To study this magnificent book is to recognize Paris’s paramount role in the development and deployment of French political glory.Although peppered with familiar masterpieces like Watteau’s “Enseigne de Gersaint,” Manet’s “Bar at the Folies-Bergère” and Picasso’s “At the Lapin Agile,” this book’s chief contribution lies in its generous array of relatively unknown paintings of Paris throughout history. Notable among the early works is the 16th-century “Pietà of St.-Germain-des-Prés,” which shows a clutch of biblical figures mourning the dead Christ at the foot of his cross, with the Abbey of St.-Germain-des-Prés, a significant seat of medieval ecclesiastical power, in the background. At the time, the juxtaposition of Golgotha and Paris would have boosted the city’s claims to being a new Jerusalem; today, it offers the viewer a rare glimpse of the St.-Germain abbey, still one of the Left Bank’s foremost landmarks, in its earliest days. Other pictures call to mind the links between city architecture and secular authority. The Renaissance king Henri IV’s penchant for grand public works gave the capital such august monuments as the Pont Neuf and the Place Royale (today the Place des Vosges) — monuments captured in paint by artists who saw the city changing dramatically before their eyes. Dramatic change is also evident in the book’s many images of violent social upheaval. During the revolutions of 1789, 1830, 1848 and 1871, crowds laid waste to Parisian monuments explicitly understood as stand-ins for state authority. In their erection and their destruction alike, urban structures cannot be dissociated from the political superstructures that created them. Reformulating Mercier’s criticism of Louis XIV’s relationship to Paris, then, one might complain not that the king didn’t spend enough money adding to its splendors, but that he failed to coin a phrase that he and practically all other French leaders might have made their motto: Paris, c’est moi.

http://www.nytimes.com/2009/12/06/books/review/WeberParis-t.html?ref=design

**The Circular Logic of the Universe**
**By NATALIE ANGIER**

CIRCLING my way not long ago through the Vasily Kandinsky show now on display in the suitably spiral setting of the Guggenheim Museum, I came to one of the Russian master's most illustrious, if misleadingly named, paintings: "Several Circles."

Those "several" circles, I saw, were more like three dozen, and every one of them seemed to be rising from the canvas, buoyed by the shrewdly exuberant juxtapositioning of their different colors, sizes and apparent translucencies. I learned that, at around the time Kandinsky painted the work, in 1926, he had begun collecting scientific encyclopedias and journals; and as I stared at the canvas, a big, stupid smile plastered on my face, I thought of yeast cells budding, or a haloed blue sun and its candied satellite crew, or life itself escaping the careless primordial stew.

I also learned of Kandinsky's growing love affair with the circle. The circle, he wrote, is "the most modest form, but asserts itself unconditionally." It is "simultaneously stable and unstable," "loud and soft," "a single tension that carries countless tensions within it." Kandinsky loved the circle so much that it finally supplanted in his visual imagination the primacy long claimed by an emblem of his Russian boyhood, the horse.

Quirkily enough, the artist's life followed a circular form: He was born in December 1866, and he died the same month in 1944. This being December, I'd like to honor Kandinsky through his favorite geometry, by celebrating the circle and giving a cheer for the sphere. Life as we know it must be lived in the round, and the natural world abounds in circular objects at every scale we can scan. Let a heavenly body get big enough for gravity to weigh in, and you will have yourself a ball. Stars are giant, usually symmetrical balls of radiant gas, while the definition of both a planet like Jupiter and a plutoid like Pluto is a celestial object orbiting a star that is itself massive enough to be largely round.

On a more down-to-earth level, eyeballs live up to their name by being as round as marbles, and, like Jonathan Swift's ditty about fleas upon fleas, those soulful orbs are inscribed with circular irises that in turn are pierced by circular pupils. Or think of the curved human breast and its bull's-eye areola and nipple.

Our eggs and those of many other species are not egg-shaped at all but spherical, and when you see human eggs under a microscope they look like tranquil suns with Kandinsky coronas behind them. Raindrops start life in the clouds not with the pear-shaped contours of a cartoon teardrop, but as liquid globes, aggregates of water molecules that have condensed around specks of dust or salt and then mutually clung themselves into the rounded path of least resistance. Only as the raindrops fall do they lose their symmetry, their bottoms often flattening out while their tops stay rounded, a shape some have likened to a hamburger bun.

Sometimes roundness is purely a matter of physics. "The shape of any object represents the balance of two opposing forces," explained Larry S. Liebovitch of the Center for Complex Systems and Brain Sciences at Florida Atlantic University. "You get things that are round when those forces are isotropic, that is, felt equally in all directions."

In a star, gravity is pulling the mass of gas inward toward a central point, while pressure is pushing the gas outward, and the two competing forces reach a dynamic détente — "simultaneously stable and unstable," you might say — in the form of a sphere. For a planet like Earth, gravity tugs the mostly molten rock in toward the core, but the rocks and their hostile electrons push back with equal vehemence. Plutoids are also sufficiently massive for gravity to overcome the stubbornness of rock and smooth out their personal lumps, although they may not be the gravitationally dominant bodies in their neighborhood In precipitating clouds, water droplets are exceptionally sticky, as the lightly positive end of one water molecule seeks the lightly negative end of another. But, again, mutually hostile electrons put a limit on molecular intimacy, and the compromise conformation is shaped like a ball. "A sphere is the most compact way for an object to form itself," said Denis Dutton, an evolutionary theorist at the University of Canterbury in New Zealand.

A sphere is also tough. For a given surface area, it's stronger than virtually any other shape. If you want to make a secure container using the least amount of material, Dr. Liebovitch said, make that container round. "That's why, when you cook a frankfurter, it always splits in the long direction," he said, rather than along its circumference. The curved part has the tensile strength of a sphere, the long axis that of a rectangle: no contest.

The reliability of bubble wrap may help explain some of the round objects found among the living, where the shapes of body parts are assumed to have some relation to their purpose. Eggs are a valuable commodity in nature, and if a round package is the safest option, by all means, make them caviar round. Among many birds, of course, eggs are oval rather than round, a trait that biologists attribute to both the arduous passage the egg makes through the avian oviduct, and the fact that oval eggs roll in a circle rather than a straight line and thus are less likely to fall out of a nest.

Yet scientists admit that they don't always understand the evolutionary pressures that sculpture a given carbon-based shape.

While studying the cornea at Columbia University College of Physicians and Surgeons, Dr. Liebovitch became curious about why eyeballs are round. "It seemed like their most salient feature," he said. He explored the options. To aid in focusing? But only a small region of the retina is involved in focusing, he said, and the whole spherical casing seems superfluous to the optical needs of that foveal patch. To enable the eye to roll easily in the socket and dart this way and that? But birds and other animals with fixed eyes still have bulging round eyeballs. "It's not really clear what the reason is," he said.

And for speculative verve, nothing beats the assortment of hypotheses that have been put forth to explain the roundness of the human female breast. It's a buttock mimic. It's a convenient place to store fat for hard times. It's a fertility signal, a youth signal, a health signal, a wealth symbol. Large breasts emphasize

the woman's comparatively small waist, which is really what men are interested in. As for me, I'm waiting for somebody to explain why a man's well-developed bicep looks like a wandering breast. Whatever the prompt, our round eyes are drawn to round things. Jeremy M. Wolfe of Harvard Medical School and his colleagues found that curvature was a basic feature we used while making a visual search. Maybe we are looking for faces, a new chance to schmooze.

Studying rhesus monkeys, Doris Tsao of the California Institute of Technology and her colleagues identified a set of brain cells that responded strongly to images of faces, monkey and otherwise. The only other sort of visual stimulus that aroused those face tracing neurons, Dr. Tsao said, were round objects — clocks, apples and the like. She suspects the results would be similar for humans. We make a fetish of faces. "If you have a round object with two spots in the middle," she said, "that instantly attracts your attention."

Or maybe the circle beckons not for its resemblance to human face but as a mark of human art. Dr. Dutton, author of "The Art Instinct," pointed out that perfect shapes were exceedingly rare in nature. "Take a look at a billiard ball," he said. "It's impossible to imagine that nature threw that one up." We are predisposed to recognize "human artifacture," he said, and roundness can be a mark of our handiwork. When nature does play the meticulous Michelangelo, we are astonished.

"People come to see the Moeraki boulders of New Zealand," he said, "and ooh and aah because they're so amazingly spherical."

Artists in turn have used the circle as shorthand for the divine: in mandalas, rose windows, the lotus pad of the Buddha, the halos of Christian saints. For Kandinsky, said Tracey Bashkoff, who curated the Guggenheim exhibition, the circle was part of a "cosmic language" and a link to a grander, more spiritual plane. A round of applause! We've looped back to Kandinsky again.

http://www.nytimes.com/2009/12/08/science/08angier.html?ref=science

**Optimism as Artificial Intelligence Pioneers Reunite**
**By JOHN MARKOFF**

STANFORD, Calif. — The personal computer and the technologies that led to the Internet were largely invented in the 1960s and ’70s at three computer research laboratories next to the Stanford University campus.

One laboratory, Douglas Engelbart’s Augmentation Research Center, became known for the mouse; a second, Xerox’s Palo Alto Research Center, developed the Alto, the first modern personal computer. But the third, the Stanford Artificial Intelligence Laboratory, or SAIL, run by the computer scientist John McCarthy, gained less recognition.

That may be because SAIL tackled a much harder problem: building a working artificial intelligence system. By the mid-1980s, many scientists both inside and outside of the artificial intelligence community had come to see the effort as a failure. The outlook was more promising in 1963 when Dr. McCarthy began his effort. His initial proposal, to the Advanced Research Projects Agency of the Pentagon, envisioned that building a thinking machine would take about a decade.

Four and a half decades later, much of the original optimism is back, driven by rapid progress in artificial intelligence technologies, and that sense was tangible last month when more than 200 of the original SAIL scientists assembled at the William Gates Computer Science Building here for a two-day reunion.

During their first 10 years, SAIL researchers embarked on an extraordinarily rich set of technical and scientific challenges that are still on the frontiers of computer science, including machine vision and robotic manipulation, as well as language and navigation.

In 1966, the laboratory took up residence in the foothills of the Santa Cruz Mountains behind Stanford in an unfinished corporate research facility that had been intended for a telecommunications firm.

The atmosphere, however, was anything but button-down corporate. The antiwar movement and the counterculture were in full swing, and the lab reflected the widely disparate political views and turmoil of the time. Dr. McCarthy was a committed leftist who would gradually move to the right during the ’60s; Les Earnest, the laboratory’s deputy director, who had worked in government intelligence, would move to the left.

The graduate students soon discovered the building’s attic and took up residence there. Mr. Earnest found a clever way, known in the parlance of the A.I. community as a “hack,” to pay for a sauna in the basement of the building, and because many of the young researchers were devotees of Tolkien’s “Lord of the Rings,” they created a special font in Elvish and used it to identify offices as places from Middle Earth.

The scientists and engineers who worked at the laboratory constitute an extraordinary Who’s Who in the computing world.

Dr. McCarthy coined the term artificial intelligence in the 1950s. Before coming to SAIL he developed the LISP programming language and invented the time-sharing approach to computers. Mr. Earnest designed the first spell-checker and is rightly described as the father of social networking and blogging for his contribution of the finger command that made it possible to tell where the laboratory's computer users were and what they were doing.

Among others, Raj Reddy and Hans Moravec went on to pioneer speech recognition and robotics at Carnegie Mellon University. Alan Kay brought his Dynabook portable computer concept first to Xerox PARC and later to Apple. Larry Tesler developed the philosophy of simplicity in computer interfaces that would come to define the look and functioning of the screens of modern Apple computers — what is called the graphical user interface, or G.U.I.

Don Knuth wrote the definitive texts on computer programming. Joel Pitts, a Stanford undergraduate, took a version of the Space War computer game and turned it into the first coin-operated video game — which was installed in the university's student coffee house — months before Nolan Bushnell did the same with Atari. The Nobel Prize-winning geneticist Joshua Lederberg worked with Edward Feigenbaum, a computer scientist, on an early effort to apply artificial intelligence techniques to create software to act as a kind of medical expert.

John Chowning, a musicologist, referred to SAIL as a "Socratean abode." He was invited to use the mainframe computer at the laboratory late at night when the demand was light, and his group went on to pioneer FM synthesis, a technique for creating sounds that transforms the quality, or timbre, of a simple waveform into a more complex sound. (The technique was discovered by Dr. Chowning at Stanford in 1973 and later licensed to Yamaha.)

The laboratory merged with the computer science department at Stanford in 1980, reopened in 2004, and is now enjoying a renaissance. Its trajectory can be seen in the progress made since 1970, when a graduate researcher programmed a robot to automatically follow a white line under controlled lighting conditions at eight-tenths mile per hour. Thirty-five years later, a team of artificial intelligence researchers at Stanford would equip a Volkswagen Touareg named Stanley with lasers, cameras and a cluster of powerful computers to drive autonomously for 131 miles over mountain roads in California at an average speed of 19.1 miles per hour to win $2 million in the 2005 Darpa Grand Challenge, a robotic vehicle contest.

"We are a first-class citizen right now with some of the strongest recent advances in the field," said Sebastian Thrun, a roboticist who is the director of SAIL and was one of the leaders of the Stanley team.

The reunion also gave a hint of what is to come. During an afternoon symposium at the reunion, several of the current SAIL researchers showed a startling video called "Chaos" taken from the Stanford Autonomous Helicopter project. An exercise in machine learning, the video shows a model helicopter making a remarkable series of maneuvers that would not be possible by a human pilot. The demonstration is particular striking because the pilot system first learned from a human pilot and then was able to extend those skills.

But an artificial intelligence? It is still an open question. In 1978, Dr. McCarthy wrote, "human-level A.I. might require 1.7 Einsteins, 2 Maxwells, 5 Faradays and .3 Manhattan Projects."

http://www.nytimes.com/2009/12/08/science/08sail.html?ref=science

**New NASA Craft, With Infrared Power, Will Map the Unseen Sky**
**By DENNIS OVERBYE**

Most of the light from stars and other objects like planets in the universe is doubly invisible. It comes in the form of infrared, or heat radiation, with wavelengths too long for our eyes to pick up. Moreover, most infrared wavelengths do not penetrate the Earth's atmosphere to get to our unseeing eyes.

So to take a proper inventory of cosmic shenanigans, astronomers have had to take to space. On Friday, they will get a little more help when the National Aeronautics and Space Administration is scheduled to launch the Wide-field Infrared Survey Explorer, or WISE, into orbit from Vandenberg Air Force Base in California as early as 9:09 a.m., Eastern time.
Circling the Earth in a polar orbit 300 miles high, the spacecraft, equipped with a 16-inch telescope and infrared detectors, will photograph the entire sky every six months.
WISE is a successor to the Infrared Astronomy Satellite, or IRAS, which was launched in 1983 and made the first heat maps of the sky. And it is a trailblazer for the giant James Webb Space Telescope due in 2014.
But whereas IRAS had 62 pixels in its camera, WISE has 4 million, said Edward L. Wright of the University of California, Los Angeles, principal investigator for the spacecraft. As a result, WISE will be hundreds of times as sensitive as its predecessor and able to survey a vastly larger volume of space.
Dr. Wright said he and his colleagues expected to see millions of new infrared sources, including ultraluminous galaxies that are breeding stars copiously inside shrouds of dust, and a thousand of the cool almost-stars known as brown dwarfs, which are bigger than Jupiter but too small to ignite thermonuclear reactions.
"We should find out how many old, cold brown dwarfs are out there," Dr. Wright said.
The other prime targets include asteroids, especially so-called near-Earth objects that might one day pose a threat to civilization. The WISE astronomers hope to measure the diameters of hundreds of thousands of asteroids to get a better sense of how dangerous they are.
Dr. Wright said the project had been almost 12 years in the making and cost $320 million, including operations and launching.
"What we hope to do is find the most interesting objects for next-generation telescopes to look at," he said.
"If we don't find something totally unexpected," he added, "I'll be surprised."

http://www.nytimes.com/2009/12/08/science/space/08wise.html?ref=science

**Postpartum Depression Strikes Fathers, Too**

By RICHARD A. FRIEDMAN, M.D.

The pregnancy was easy, the delivery a breeze. This was the couple's first baby, and they were thrilled. But within two months, the bliss of new parenthood was shattered by postpartum depression.

A sad, familiar story. But this one had a twist: The patient who came to me for treatment was not the mother but her husband.

A few weeks after the baby arrived, he had become uncharacteristically anxious, sad and withdrawn. He had trouble sleeping, even though his wife was the one up at night breast-feeding their new son. What scared her enough to bring him to my office was that he had become suicidal.

Up to 80 percent of women experience minor sadness — the so-called baby blues — after giving birth, and about 10 percent plummet into severe postpartum depression. But it turns out that men can also have postpartum depression, and its effects can be every bit as disruptive — not just on the father but on mother and child.

We don't know the exact prevalence of male postpartum depression; studies have used different methods and diagnostic criteria. Dr. Paul G. Ramchandani, a psychiatrist at the University of Oxford in England who did a study based on 26,000 parents, reported in The Lancet in 2005 that 4 percent of fathers had clinically significant depressive symptoms within eight weeks of the birth of their children. But one thing is clear: It isn't something most people, including physicians, have ever heard of.

At first, my patient insisted that everything was just fine. He and his wife had been trying to conceive for more than a year. He was ecstatic at the prospect of fatherhood, and he did not acknowledge feeling depressed or suicidal.

Suspicious of his rosy appraisal, I pushed a little.

It turned out that he had just taken a new high-pressure job in finance six months before the birth of his son. Though he was reluctant to admit it, he clearly had more than a little concern about his family's financial future.

And he was anxious about his marriage and his new life. “We go out a lot with friends to dinner and theater,” he said wistfully, as I recall. “Now I guess that’s all going to end.”

He had spent the nine months of pregnancy in a state of excitement about being a father without really registering what a life-transforming event it was going to be.

Unlike women, men are not generally brought up to express their emotions or ask for help. This can be especially problematic for new fathers, since the prospect of parenthood carries all kinds of insecurities: What kind of father will I be? Can I support my family? Is this the end of my freedom?

And there is probably more to male postpartum depression than just social or psychological stress; like motherhood, fatherhood has its own biology, and it may actually change the brain.

A 2006 study on marmoset monkeys, published in the journal Nature Reviews Neuroscience, reported that new fathers experienced a rapid increase in receptors for the hormone vasopressin in the brain’s prefrontal cortex. Along with other hormones, vasopressin is involved in parental behavior in animals, and it is known that the same brain area in humans is activated when parents are shown pictures of their children.

There is also some evidence that testosterone levels tend to drop in men during their partner’s pregnancy, perhaps to make expectant fathers less aggressive and more likely to bond with their newborns. Given the known association between depression and low testosterone in middle-aged men, it is possible that this might also put some men at risk of postpartum depression.

By far the strongest predictor of paternal postpartum depression is having a depressed partner. In one study, fathers whose partners were also depressed were at nearly two and a half times the normal risk for depression. That was a critical finding, for clinicians tend to assume that men can easily step up to the plate and help fill in for a depressed mother. In fact, they too may be stressed and vulnerable to depression.

And there is the child to think about. Research has clearly shown that maternal postpartum depression can impair the emotional and cognitive development of infants. A father could well buffer the infant from some of the adverse effects of maternal depression — but that is a tall order if he too is depressed.

Dr. Ramchandani, who also followed children for three and a half years after birth, reported that they were affected differently depending on which parent was depressed. Maternal postpartum depression was associated with adverse emotional and behavioral effects in children regardless of sex; depression in fathers was linked only with behavioral problems in boys. (The study did not report on possible effects when both parents were depressed.)

As for my patient, he recovered within two months with the help of psychotherapy and an antidepressant. Afterward, he summed up the situation in just 10 words: “And I thought only women get this kind of thing.”

All too many doctors think so too.

*Richard A. Friedman is a professor of psychiatry at Weill Cornell Medical College.*

http://www.nytimes.com/2009/12/08/health/08mind.html?ref=science

**Underwater Data Back Up Theory of Hawaii's Origin**
**By HENRY FOUNTAIN**

The prevailing theory for the origin of the Hawaiian Islands is that the volcanoes that formed them are the result of a mantle plume, an upwelling of hot material from deep within the earth.

But it is just a theory, one that has had its share of naysayers over the years.
"People have been waiting for high-resolution seismic imaging," said Cecily J. Wolfe of the University of Hawaii at Manoa. By showing how seismic waves from earthquakes travel through the mantle below Hawaii, seismometers would go a long way toward settling the matter.
One reason the issue has not been resolved is the difficulty of putting seismometers in the ocean around Hawaii. That problem has now been overcome, using a network of recoverable seismometers deployed on the seabed by scientists from the Scripps Institution of Oceanography and the Woods Hole Oceanographic Institution. Together with data from seismometers on the islands themselves, the data support the idea of a mantle plume below Hawaii. It's a deep one, too, extending at least 900 miles into the mantle.
Shear waves from earthquakes travel more slowly through high-temperature areas of the mantle. Using data from quakes of magnitude 5.5 or higher, the researchers were able to put together three-dimensional images of the mantle, "kind of like a CAT scan," said Dr. Wolfe, lead author of a paper in Science on the study. Those images revealed the presence of the plume.
"To see it, and as deep as we saw it, was very exciting," Dr. Wolfe said. "It really does support the idea that plumes are features that come from the lower mantle."
As for the naysayers, Dr. Wolfe is optimistic that with further analysis of the data, the findings will hold up. "More people feel cautiously supportive," she said.

http://www.nytimes.com/2009/12/08/science/08obplume.html?ref=science

***The Perils of Being Selfish With Shellfish***

By: Melinda Burns

It was good news when scientists in Puerto Peñasco, a fishing and tourism hub in Baja California, found proof for the first time of the rapid "reseeding" effects of marine reserves —- how a no-fishing zone can replenish fish stocks by exporting babies beyond its boundaries.

The Puerto Peñasco divers were worried about the declining stocks of snails and scallops, the bread and butter of their trade. So, beginning in 2001, they worked closely with researchers to design, set up and monitor three de facto marine reserves where fishing was banned. The no-fishing zones extended along 11 miles of rocky coast and around San Jorge Island, 20 miles offshore in the northeastern Gulf.

Within a year, there were big increases in the abundance of juvenile rock scallops and black murex snails both inside and outside the reserve boundaries. The bigger and older the shellfish got inside the reserve, the more larvae, or babies, they produced, and the more they drifted with the current, quickly reseeding the depleted areas where fishing was allowed.

The reserves extended over 30 percent of the fishing grounds, but the local cooperative of about 22 divers could see that it was beneficial. They volunteered their time to count scallops and snails underwater. They kept an eye on each other, too, taking occasional trips to the island to see if anyone was cheating.

During the first two years of the reserves, there were only 13 violations of the fishing ban out of 2,000 local diving trips from Puerto Peñasco. Nobody wanted to risk being ostracized. News of the thriving shellfish stocks spread along the coast. The Mexican government recognized the divers with a Presidential Conservation Award.

"Things were going so well," said Richard Cudney-Bueno, who helped design the Puerto Peñasco reserves as an adjunct biology professor at the University of Arizona School of Natural Resources and a researcher at the University of California, Santa Cruz Institute of Marine Sciences.

And then the roving bandits came.

They arrived in a handful of boats from 200 miles away, and they started poaching in the reserves that had been maintained based on trust at San Jorge Island. There was nothing the locals could do. The Mexican government had never formally recognized the fishing ban, and nobody had a legal right to throw out the newcomers.

The locals weren't going to stand by and let others reap the benefits of their investment at San Jorge. So, they joined in the poaching, and it spread from the island to the coastal reserves in a free-for-all.

Within a month, the local populations of scallops and snails plummeted by half as the divers took in big hauls, driving down the market price. By the end of two months, the shellfish stocks had dropped to pre-closure levels.

"The whole thing got wiped out due to disruption of the social structure that had supported it," said Peter Raimondi, a University of California, Santa Cruz biologist who collaborated on the study. "Scientifically, it was really interesting, but for the people who experienced it on the ground, it was terrible."

**How Reserves Work**

The establishment of marine reserves is typically controversial and fraught with conflict. Environmentalists seek the conservation benefits of "underwater parks," but the fishermen don't see

what's in it for them. Where's the proof, they want to know, that reserves can actually replenish stocks elsewhere?

In their groundbreaking study of the Puerto Peñasco reserves, published this year on the PLoS ONE blog, Cudney-Bueno, Raimondi, William Shaw of the University of Arizona and their colleagues in Mexico, describe how they were able to predict and then confirm the rapid effects of the dispersal of fish larvae outside the reserves.

By tracking local currents in the Gulf of California and calculating how far the wandering larvae would travel, the scientists pinpointed exactly where the larvae, now grown to little scallops, would eventually attach to the rocky ocean bottom. They predicted, correctly, that it would be about a 10-day trip for the floating larvae to locations between 12 and 30 miles away.

The divers counted young shellfish in the "reseeding" locations and inside the reserves both before and two years after the fishing ban went into effect. The scientists found that the density of juvenile rock scallops increased more than 40 percent inside the reserves and more than 20 percent in fishing areas outside the reserve boundaries. The density of black murex snails in fishing areas increased threefold.

Robert Warner, an evolutionary ecologist who helped design a 318-square-mile network of marine reserves around California's Channel Islands, the largest such network off the continental United States, called the Puerto Peñasco study "an important contribution to the marine reserve literature."

"It shows a rapid increase in juvenile settlement in areas downstream from reserves, after only two years," Warner said.

As previously reported by Miller-McCune, local fishermen were engaged in the monitoring efforts at the Channel Islands, just as they were at Puerto Peñasco.

But there the similarity ends. The Channel Islands marine reserves are vigorously enforced by the National Park Service, National Marine Sanctuary, U.S. Coast Guard and California Department of Fish and Game. These agencies patrol the reserve network by air, by sea and on land. The park alone spends about $350,000 per year on enforcement.

As many as 200 fishermen get verbal or written warnings or citations every year at the Channel Islands, park officials said. In addition, the patrols stop more than 1,000 boats yearly to hand out educational materials and deter them from fishing in the reserves.

**A Happy Ending**
Belatedly, the Mexican government is giving Puerto Peñasco some support.

In a before-and-after study published on the PLoS ONE blog this year, Cudney-Bueno tells how the government in 2006 finally gave the diving cooperative exclusive rights to harvest rock scallop in their fishing grounds. Such formal Mexican fishing "concessions" are rare, and Puerto Peñasco's was the first in the Gulf of California.

Today, the shellfish stocks are building back up and the diving cooperative is working with researchers to design a management plan, backed by the government, that will include permanent seasonal closures and no-fishing zones for rock scallop and quotas in areas where fishing is allowed. It will give them even more of a buffer than they had before, Cudney-Bueno said.

"It's just crucial to have control over the fishing grounds," he said. "The divers know that leaving a place untouched for some time will only lead to an increase in resources. People really can manage their own regions, but if you don't have the umbrella backup, it's very hard to control."

The Mexican government does not have the resources to regularly patrol reserves in the Gulf. But next time, if the bandits come, the Puerto Peñasco divers can legally call on the local port authority to deal with them.

The story of Puerto Peñasco's success, failure and success has given a boost to fishery protection elsewhere in the northern Gulf, with funding from the David and Lucile Packard Foundation. In Bahía de los Angeles and Bahía de Kino as well as Puerto Peñasco, fishermen are working with researchers to protect not only scallops and snails, but also stocks of crabs, lobsters, sea cucumber and groupers.

"The pie has been sliced in too many pieces in the Gulf," Cudney-Bueno said. "Some communities are really taking things into their own hands. There's a sacrifice in establishing reserves, absolutely. But there's so much belief in the resilience of the system."

http://www.miller-mccune.com/science_environment/the-perils-of-being-selfish-with-shellfish-1637?utm_source=Newsletter86&utm_medium=email&utm_content=1208&utm_campaign=newsletters

**Spices Halt Growth of Breast Stem Cells, Study Finds**

*Indian turmeric powder, the active ingredient of which is curcumin. (Credit: iStockphoto/Nilesh Bhange)*

ScienceDaily (Dec. 8, 2009) — A new study finds that compounds derived from the spices turmeric and pepper could help prevent breast cancer by limiting the growth of stem cells, the small number of cells that fuel a tumor's growth.

Researchers at the University of Michigan Comprehensive Cancer Center have found that when the dietary compounds curcumin, which is derived from the Indian spice turmeric, and piperine, derived from black peppers, were applied to breast cells in culture, they decreased the number of stem cells while having no effect on normal differentiated cells.

"If we can limit the number of stem cells, we can limit the number of cells with potential to form tumors," says lead author Madhuri Kakarala, M.D., Ph.D., R.D., clinical lecturer in internal medicine at the U-M Medical School and a research investigator at the VA Ann Arbor Healthcare System.

Cancer stem cells are the small number of cells within a tumor that fuel the tumor's growth. Current chemotherapies do not work against these cells, which is why cancer recurs and spreads. Researchers believe that eliminating the cancer stem cells is key to controlling cancer. In addition, decreasing the number of normal stem cells -- unspecialized cells that can give rise to any type of cell in that organ -- can decrease the risk of cancer.

In this study, a solution of curcumin and piperine was applied to the cell cultures at the equivalent of about 20 times the potency of what could be consumed through diet. The compounds are available at this potency in a capsule form that could be taken by mouth. **(Note: This work has not been tested in patients, and patients are not encouraged to add curcumin or piperine supplements to their diet at this time.)**

The researchers applied a series of tests to the cells, looking at markers for breast stem cells and the effects of curcumin and piperine, both alone and combined, on the stem cell levels. They found that piperine enhanced the effects of curcumin, and that the compounds interrupted the self-renewal process that is the hallmark of cancer-initiating stem cells. At the same time, the compounds had no affect on cell differentiation, which is the normal process of cell development.

"This shows that these compounds are not toxic to normal breast tissue," Kakarala says. "Women at high risk of breast cancer right now can choose to take the drugs tamoxifen or raloxifene for prevention, but most women won't take these drugs because there is too much toxicity. The concept that dietary compounds can help is attractive, and curcumin and piperine appear to have very low toxicity."

Curcumin and piperine have been explored by other researchers as a potential cancer treatment. But this paper, published online in the journal *Breast Cancer Research and Treatment*, is the first to suggest these dietary compounds could prevent cancer by targeting stem cells.

In addition, tamoxifen or raloxifene are designed to affect estrogen, which is a factor in most, but not all breast cancers. In fact, the aggressive tumors that tend to occur more often in women with a family history or genetic susceptibility are typically not affected by estrogen. Because curcumin and piperine limit the self renewal of stem cells, they would impact cancers that are not estrogen sensitive as well as those that are.

Researchers are planning an initial Phase I clinical trial to determine what dose of curcumin or piperine can be tolerated in people. The trial is not expected to begin accruing participants until spring.

Breast cancer statistics: 194,280 Americans will be diagnosed with breast cancer this year and 40,610 will die from the disease, according to the American Cancer Society

Additional authors include Dean Brenner, Hasan Korkaya, Connie Cheng, Karim Tazi, Christophe Ginestier, Suling Liu, Gabriel Dontu and Max Wicha, all from U-M

Funding was provided by the National Institutes of Health; curcumin and piperine were donated by Sabinsa Co.

**Story Source:**

Adapted from materials provided by University of Michigan Health System.

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**Journal Reference**:

1. Madhuri Kakarala, Dean E. Brenner, Hasan Korkaya, Connie Cheng, Karim Tazi, Christophe Ginestier, Suling Liu, Gabriela Dontu and Max S. Wicha. **Targeting breast stem cells with the cancer preventive compounds curcumin and piperine**. *Breast Cancer Research and Treatment*, 2009; DOI: 10.1007/s10549-009-0612-x

http://www.sciencedaily.com/releases/2009/12/091207181422.htm

**Not All Parents Place Their Babies 'Back to Sleep,' Researchers Find**

ScienceDaily (Dec. 8, 2009) — Placing infants on their backs for sleep can help reduce the risk of Sudden Infant Death Syndrome (SIDS). But a study by Yale School of Medicine researchers and their colleagues shows that while the practice helped reduce the incidence of SIDS, it has reached a plateau since guidelines were released by the National Institute of Child Health and Human Development.

Published in the December issue of the *Archives of Pediatrics and Adolescent Medicine*, the study is based on data from the National Infant Sleep Position Study, an annual telephone survey of about 1,000 households with infants. The team tracked behavior change after the "Back to Sleep" campaign was initiated in 1994. The study was conducted as a way to track infant care practices related to SIDS.

"We looked at the behavior of 15,000 caregivers over the last 15 years and found that, although there was an increase in caregivers following the guidelines, in the last five years, the number of people putting babies on their back to sleep has leveled off," said lead author Eve Colson, M.D., associate professor of pediatrics at Yale School of Medicine. "We also found that African Americans still lag behind caregivers of other races by about 20 percent in following this practice."

Colson and her team also identified three key factors linked to whether caregivers place infants on their backs to sleep: whether the caregiver received a physician's recommendation to place the baby only on the back for sleep, fear that the infant might choke and concerns for the infant's comfort.

In fact, said Colson, in the past five years, these factors have become even more important than race in determining whether parents will follow the recommended guidelines.

"If we can teach people that comfort and choking are not issues and if we can make sure that doctors advise their patients that the back is the only safe position for infant sleep, then we may be able to overcome this leveling-off of the practice that we have seen over the last five years," she said. "For the first time, we have identified modifiable factors -- comfort, choking and advice -- that can be used in public health campaigns to decrease the incidence of SIDS and possibly to bridge the racial gap."

Other authors on the study include Denis Rybin, Theodore Colton and Michael J. Corwin, M.D., of Boston University; Lauren A. Smith M.D., of the Massachusetts Department of Public Health; and George Lister, M.D., of University of Texas Southwestern Medical Center at Dallas.

The study was supported by the National Institute of Child Health and Human Development.

**Story Source:**

Adapted from materials provided by Yale University, via EurekAlert!, a service of AAAS.

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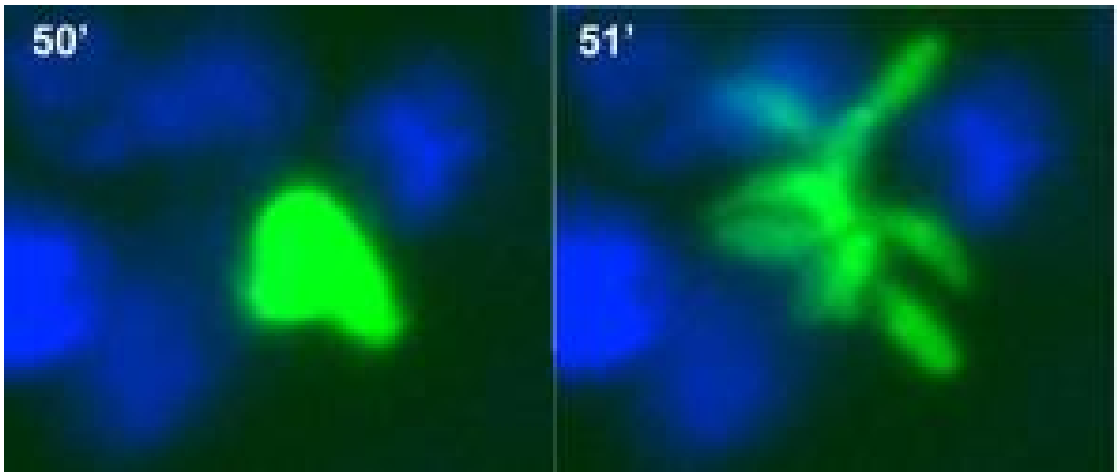
**Journal Reference**:

1. Eve R. Colson; Denis Rybin; Lauren A. Smith; Theodore Colton; George Lister; Michael J. Corwin. **Trends and Factors Associated With Infant Sleeping Position: The National Infant Sleep Position Study, 1993-2007**. *Arch Pediatr Adolesc Med*, 2009; 163 (12): 1122-1128 [link]

http://www.sciencedaily.com/releases/2009/12/091207165025.htm

**New Clues Into How Invasive Parasite Spreads**




*Images of Toxoplasma gondii just prior to (left) and during (right) egress from the host cell. (Credit: Albert Einstein College of Medicine)*

ScienceDaily (Dec. 8, 2009) — Researchers at Albert Einstein College of Medicine of Yeshiva University have discovered a possible strategy against an invasive parasite that infects more than a quarter of the world's population, including 50 million Americans.

The study, involving the single-celled parasite *Toxoplasma gondii*, was led by Amos Orlofsky, Ph.D., assistant professor of pathology at Einstein. The results, published in the current issue of the *Journal of Immunology*, suggest a new approach for treating toxoplasmosis, the disease caused by this parasite.

*T. gondii* is one of the great success stories of the parasite world, capable of infecting any warm-blooded animal. Infected people carry thousands of organisms, many of which reside in the brain. Most people infected with *T. gondii* have an inactive, or latent, infection that causes no symptoms. But *T. gondii* can cause serious brain damage in patients with HIV/AIDS, the elderly, fetuses, and others who have weakened or developing immune systems.

"Toxoplasmosis can be treated with antimalarial drugs and antibiotics, but these medications can have serious side effects, so there is much interest in finding better therapies," says Dr. Orlofsky.

People become infected by ingesting *T. gondii* oocysts (the thick-walled spore phase of the parasite found in the feces of infected cats) or by eating undercooked pork or other infected meat. Once the parasite is swallowed, its tachyzoites (the form of the parasite that causes disease in humans) multiply by infecting cells and then reproducing several times within each cell. Finally, the parasitic cargo ruptures its host cell and exits to infect new cells.

In prior research, petri dish studies had suggested that tachyzoites progress through five to seven cell-division cycles over a leisurely two to three days before rupturing the host cell and initiating a new round of infection. But in a key finding, the Einstein team discovered that in real life (infected mice in this case), the multiplication cycle goes much faster: After infecting macrophages -- the immune cells that are among their favorite targets -- infecting parasites rupture the cells in about six hours after undergoing only one or two cell-division cycles.

In a second major finding, the Einstein team discovered a clue to why parasites burst from their macrophage hosts after just one or two rounds of reproduction: Macrophages rushing to the infection site somehow signal to their infected brethren in a way that stimulates parasites to abandon ship. The researchers suspect that this reaction reflects a shift in the stance of the host cell from passivity to hostility

with respect to the parasites within. "Sensing that their host cell is in attack mode, the parasites may respond by taking an early exit," says Dr. Orlofsky.

The scientists don't yet know the mechanism by which immune cells trigger the parasites' early exit from infected cells. But drugs with this mode of action might help to curb or even eliminate toxoplasmosis by encouraging infected cells to combat their parasites. Such drugs might work well in combination with treatments that block the parasites' escape route. "If we can make the parasites want to leave, but stop them from doing so, that could be the basis of an effective therapy," says Dr. Orlofsky.

Dr. Orlofsky's paper, "Externally Triggered Egress Is the Major Fate of Toxoplasma gondii during Acute Infection," was published October 21 in the online edition of the *Journal of Immunology*. Tadakimi Tomita, a Ph.D. student at Einstein, is the lead author. The other Einstein contributors were Tatsuya Yamada, also a Ph.D. student, and Louis M. Weiss, M.D., M.P.H., a professor of medicine and of pathology.

**Story Source:**

Adapted from materials provided by Albert Einstein College of Medicine of Yeshiva University.

http://www.sciencedaily.com/releases/2009/12/091205133633.htm

**Scientists at Climate Talks Say Major Changes to the Nitrogen Cycle Cannot Be Ignored**


*Global nitrogen cycle and planetary boundaries. Taken from the cover of the International Geosphere-Biosphere Programme's Global Change magazine. (Credit: Copyright Randy Lyhus (2009) for the International Geosphere-Biosphere Programme)*

ScienceDaily (Dec. 8, 2009) — An international group of scientists say there is an immediate need for a global assessment of the nitrogen cycle and its impact on climate.

On a planetary scale, human activities, especially fertiliser application, have more than doubled the amount of reactive nitrogen in circulation on land. This massive alteration of the nitrogen cycle affects climate, food security, energy security, human health and ecosystem health. The long-term consequences of these changes are yet to be fully realised, but the human impact on the nitrogen cycle has so far been largely missed in international environmental assessments.

Nitrogen's role in climate change will be highlighted at an event on 7 December at the COP-15 United Nations Climate Change Conference in Copenhagen. Event organisers will be calling for a new assessment of nitrogen and climate, which will identify innovative nitrogen management strategies for global climate change mitigation and associated co-benefits to society.

Dr Cheryl Palm, the chair of the International Nitrogen Initiative (INI), which is organising the event, said "Nitrogen and climate interactions are not yet adequately included in the Intergovernmental Panel on Climate Change assessment process. There is an urgent need to assess the possibilities of nitrogen management for climate abatement and at the same time increase food security, while minimising environmental and human health impacts."

Dr Palm added, "We believe that in tackling nitrogen new opportunities for climate abatement will be created."

Professor Jan Willem Erisman from the Energy Research Centre of the Netherlands, who will speak at the event said: "An internationally-coordinated global nitrogen assessment is urgently required. A special report on nitrogen and climate is the natural first step."

Kilaparti Ramakrishna, Senior Advisor on Environmental Law and Conventions at UNEP who will give the opening address at the side event said, "The nitrogen cycle is changing faster than that of any other element. In addition, the effects of reactive nitrogen are not limited to a single medium. A single molecule of reactive nitrogen may transition through many forms -- ammonia, nitrogen oxide, nitric acid, nitrate and organic nitrogen -- and may successively lead to a number of environmental, health and social impacts, including contributing to higher levels of ozone in the lower atmosphere. Over the last decade a number of global, regional and national initiatives have identified and addressed the issue of nutrient enrichment to the coastal zone. However, programmes are dispersed and fragmented and there is no single place to go for an overview of available information tools and mechanisms."

Professor Sybil Seitzinger, Executive Director of the International Geosphere-Biosphere Programme said, "We have changed the complexity of the nitrogen cycle profoundly and are unaware of all the implications. In the meantime, policies that affect the nitrogen cycle are often made in isolation of the range of their impacts. This is in part because policies are made in departments/ministries with responsibility for only certain sectors (e.g., air, agriculture, etc.). Furthermore, the scientific community does not yet have an integrated understanding of the multiple impacts and feedbacks of changes in the nitorgen cycle, or the interconnections with other cycles, like carbon. An integrated global nitrogen assessment is needed as soon as possible. This will support the development of tools for policy makers to understand the multiple implications of their decision."

The INI team believes that it is essential to untangle the complexity of the nitrogen and carbon cycle, identify the advantages of nitrogen management for climate abatement and investigates the costs and barriers to be overcome. Such an assessment needs to distinguish between developed areas where there is already an excess of nitrogen and the developing parts of the world where nitrogen management can help increase food security. Improved Nitrogen management will help limit fertilizer use, increase its efficiency and increase carbon sequestration in soils, decrease N2O emissions, while limiting other environmental and human health impacts.

The side event "Options for Including Nitrogen Management in Climate Policy Development" will be held in the US centre (Hall C5) from 6pm local time. The event will be followed by a networking reception supported by the Centre for Ecology & Hydrology (CEH), United Kingdom The organisers of the side event are the INI, CEH, the Ministry of Housing and Spatial Planning and Environment (VROM) of The Netherlands, the United Nations Environment Programme -- Global Partnership on Nutrient Management (UNEP/GPNM), the David and Lucile Packard Foundation, SCOPE, the International Geosphere-Biosphere Programme, COST and the European Science Foundation Nitrogen in Europe Research Networking Programme (NinE-ESF).

**Story Source:**

Adapted from materials provided by International Geosphere-Biosphere Programme (IGBP), via AlphaGalileo.

http://www.sciencedaily.com/releases/2009/12/091206183705.htm

**Recreational Drug Use Is Related to Impulsive Behavior, Spanish Research Reveals**

ScienceDaily (Dec. 8, 2009) — A group of psychologists from the University of Almeria in Spain, led by Dr. Pilar Flores and Flor Zaldívar, has just concluded a study regarding the use of addictive substances by young university students and the manifestation of impulsive behaviour in the same group of people, on a cognitive and psychomotor level.

According to the data produced by this project, regular consumers of cannabis and alcohol are more impulsive than non-users. However, there is no evidence of the differences between both of these consumer groups, which makes these experts believe that "consuming these substances, whatever their nature, is related to impulsivity."

This study, which began in October 2006, was promoted by the Department for Equal Opportunities and Social Welfare with a total financing of 30,061 Euros.

In an attempt to discover if recreational use of these substances -- alcohol and cannabis -- affects the youth's impulsivity, this behaviour was measured in three categories: motor impulsivity, cognitive impulsivity and unplanned impulsivity. To achieve this goal a population sample was taken of a total of 575 students, 50.7% were women and 49.3% were men, who were assigned to three groups depending on their drug use habits.

They observed, in the first samplings, that 21.4% corresponds to the chronic cannabis users' category, 32.5% drink alcohol, and the remaining 34.6% do not consume any type of drugs. Moreover, it seems that gender influences consumption patterns, since 62.5% of the male population sample are usual consumers of one of these substances versus 45.6% of the women. Similarly, men consume higher amounts of both substances.

The results show significant behaviour differences depending on the analysed groups. Cognitive impulsivity may be defined as the subject's tendency to give quick responses, especially in tasks that implicitly or explicitly imply uncertain responses, and therefore, they make more mistakes.

As regards to the analysis of the data obtained in the laboratory tests that measure this type of impulsivity, the student groups that consumed addictive substances showed more impulsive behaviour than nonusers. However, this pattern changes when one takes into account motor tasks, where this correlation has only been proven in the case of cannabis users. Motor Impulsivity, implies acting without thinking and being driven by the momentum.

In conclusion, these experts explain "it is undeniable that university students regularly consume addictive substances. On the other hand, it seems clear that there is a relationship between drug use and impulsive behaviour although we still have to clarify whether this attitude is a cause or a result of drug use."

**Story Source:**

Adapted from materials provided by Andalucía Innova, via AlphaGalileo.

http://www.sciencedaily.com/releases/2009/12/091206184626.htm

**Self-Destructing Bacteria Improve Renewable Biofuel Production**

*Small pond full of cyanobacteria. (Credit: iStockphoto)*

ScienceDaily (Dec. 8, 2009) — An Arizona State University research team has developed a process that removes a key obstacle to producing lower-cost, renewable biofuels. The team has programmed a photosynthetic microbe to self-destruct, making the recovery of high-energy fats--and their biofuel byproducts--easier and potentially less costly.

"The real costs involved in any biofuel production are harvesting the goodies and turning them into fuel," said Roy Curtiss, director of the Biodesign Institute's Center for Infectious Diseases and Vaccinology and professor in the School of Life Sciences. "This whole system that we have developed is a means to a green recovery of materials not requiring energy dependent physical or chemical processes."

Curtiss is part of a large, multidisciplinary ASU team that has been focusing on optimizing photosynthetic microbes, called cyanobacteria, as a source of renewable biofuels. These microbes are easy to genetically manipulate and have a potentially higher yield than any plant crops currently being used as transportation fuels.

But, until now, harvesting the fats from the microbes required many cost-intensive processing steps. Cyanobacteria have a multi-layer, burrito-like, protective set of outer membranes that help the bacteria thrive in even harsh surroundings, creating the pond scum often found in backyard swimming pools.

To get the cyanobacteria to more easily release their precious, high fat cargo, Curtiss and postdoctoral researcher Xinyao Liu, placed a suite of genes into photosynthetic bacteria that were controlled by the simple addition of trace amounts of nickel to the growth media.

"Genetics is a very powerful tool," said Liu. "We have created a very flexible system that we can finely control."

The genes were taken from a mortal bacterial enemy, called a bacteriaphage, which infect the bacteria, eventually killing the microbes by causing them to burst like a balloon. The scientists swapped parts from bacteriaphages that infect E. coli and salmonella, simply added nickel to the growth media, where the inserted genes produced enzymes that slowly dissolved the cyanobacteria membranes from within (see figure 1).

This is the first case of using this specialized bacterial system and placing it in cyanobacteria to cause them to self-destruct. "This system is probably one of a kind," said Curtiss, who has filed a patent with Xinyao Liu on the technology. Curtiss has been a pioneer in developing new vaccines, now working on similar systems to develop a safe and effective pneumonia vaccine.

The project is a prime example of the multidisciplinary, collaborative spirit of ASU research. Other key contributors were School of Life Sciences professor Wim Vermaas, an expert on the genetic manipulation techniques of cyanobacteria, Robert Roberson, for help with transmission electron microscopy, Daniel Brune, who did mass spectrometer analyses of the lipid products, and many other colleagues in the ASU biofuel project team.

The project has also been the beneficiary of the state of Arizona's recent strategic investments to spur new innovation that may help foster future green and local industries. The state's abundant year-round sunshine and warm temperatures are ideally suited for growing cyanobacteria.

"This probably would never have gone anywhere if Science Foundation Arizona or BP had not funded the project," said Curtiss. The $5 million in funding was key to scaling up and recruiting new talent to work on the project, including paper first author Xinyao Liu, an expert in microbiology and genetics who had recently earned his Ph.D. from the prestigious Peking University in Beijing, China.

"Xinyao is unique," said Curtiss. "If he were a baseball player, he wouldn't be satisfied with anything less than a 1000 home runs in 10 years. Xinyao is always swinging for the fences. Now, we are moving forward with a number of new approaches to see how far we can push the envelope." The next phase of the research is being funded by a two-year, $5.2 million grant from the U.S. Department of Energy (DOE) led by researcher Wim Vermaas, Curtiss, Liu and others from the ASU biofuel team.

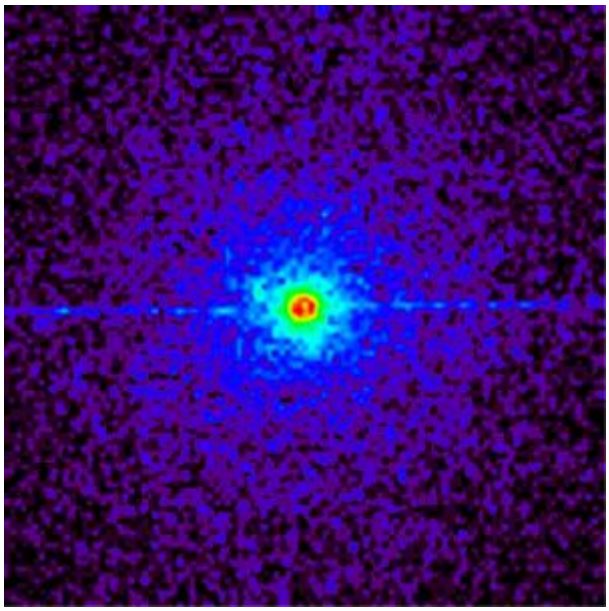
The results were published in the Dec. 7 issue of the *Proceedings of the National Academy of Sciences*.

**Story Source:**

Adapted from materials provided by Arizona State University, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/12/091207173624.htm

**Solving the Mysteries of Enigmatic Binary Star System Cygnus X-3**



*Cygnus X-3 and scattering halo. (Credit: NASA-MSFC/SRON/MPE)*

ScienceDaily (Dec. 8, 2009) — Deep in our Galaxy, approximately 30,000 light-years from Earth, a small gravitational monster is sucking matter from a companion star, causing the infalling matter to violently radiate X-rays and occasionally be launched to form radio-wave-emitting jets that emanate close to the speed of light. This enigmatic binary star system, known as Cygnus X-3, has fascinated astronomers over four decades. It is thought to be either a small black hole or a neutron star and an ordinary, albeit massive star orbiting each other. Now, a team of researchers, including TKK's Metsähovi Radio Observatory, have made the first definitive detection of high-energy gamma rays from this system.

The findings may provide a new window on how Cygnus X-3 accelerates charged particles to enormous energies.

The study is scheduled to appear in an upcoming *Nature*.

Detecting the gamma rays, the most powerful type of electromagnetic radiation, is a feat in itself, and in this study their detection were made possible by sensitive detectors on-board italian gamma-ray satellite AGILE (Astro-rivelatore Gamma ad Immagini Leggero). From these observations an unexpected clockwork pattern of the gamma-ray emission was noted, which always seems to occur just before the onset of the powerful radio jets.

"Cygnus X-3 is a strange case indeed, being one of the brightest radio source in the Galaxy except when it descends into a radio quenched state. And now these extremely energetic gamma rays have been observed during this state. This may be indicating the preparation of the major radio flare, which follows just days after, when the source shoots up energetic radio jets from the core of the compact object," says researcher Karri Koljonen from Metsähovi Radio Observatory.

The new gamma-ray findings are expected to shed also light on how distant quasars, powered by supermassive black holes, pump even greater amounts of energy into space. Microquasars such as Cygnus X-3 are the ideal laboratory for studying the jet phenomena that dominate the most luminous quasars' emission. Because the emissions from microquasars vary on time scales of days to weeks rather than decades like quasar emissions, they present a convenient test bed for probing quasar activity.

The gamma rays observed by AGILE were in the form of flares at energies of about 100 million electron volts. Simultaneously the source was observed by AMILA (Arcminute Microkelvin Imager Large Array) and RATAN-600 radio telescopes from UK and Russia together with NASA's Swift and RXTE (Rossi X-ray Timing Explorer) X-ray satellites, which revealed that the flares preceded radio jets and occurred during a decline in high-energy X-rays from Cygnus X-3.

"The very complex behavior of Cygnus X-3 requires monitoring throughout the electromagnetic spectrum from radio through X-rays and now including also gamma-ray emission. Not until we have gathered data from all possible wavelengths we can start to form a unified picture of this enigmatic object. Microquasars have strong magnetic fields which can store enormous amount of energy. During these gamma-ray flares this stored energy can accelerate charged particles to observed high energies which prompts them to emit gamma rays. Then the magnetic gate opens, and radio-emitting blobs are pushed out of the system producing the major radio flares," Koljonen concludes.

Metsähovi will stay as a radio eyes for Cygnus X-3 along with other international radio, infrared, X-ray and gamma-ray facilities.

**Story Source:**

Adapted from materials provided by Helsinki University of Technology, via AlphaGalileo.

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**Journal Reference**:

1. Tavani et al. **Extreme particle acceleration in the microquasar Cygnus X-3**. *Nature*, 2009; 462 (7273): 620 DOI: 10.1038/nature08578

http://www.sciencedaily.com/releases/2009/12/091206184436.htm

**The End of Deforestation in the Brazilian Amazon?**

ScienceDaily (Dec. 7, 2009) — A new article in the December 4 issue of *Science* addresses how the combined efforts of government commitments and market transition could save forest and reduce carbon emissions in Brazil.

The Policy Forum brief was authored by contributors from the Woods Hole Research Center, Instituto de Pesquisa Ambiental da Amazonia (IPAM), Universidade Federal de Minas Gerais, Aliança da Terra, Environmental Defense Fund, University of Florida, Universidad Rey Juan Carlos, and the Universidade Federal do Pará.

According to Daniel Nepstad, a senior scientist at the Woods Hole Research Center and the study's lead author, "market forces and Brazil's political will are converging in an unprecedented opportunity to end deforestation in the Brazilian Amazon with 80 percent of the forest still standing."

Brazil has lowered deforestation rates 64 percent since 2005. This remarkable achievement was possible through a government crack-down on illegal activities in the region. It was helped by a retraction of the cattle and soybean industries, and a growing effort to exclude deforesters from the beef and soy markets. The article describes how Brazil could build upon this progress to end forest clearing by the year 2020, and the additional funding that will be required to reach this goal.

The study estimates that $6.5 to $18 billion will be needed from 2010 to 2020 to achieve the end of deforestation, resulting in a 2 to 5 percent reduction in global carbon dioxide emissions. The steps include the support of low-deforestation livelihoods for forest peoples and smallholders; identifying and rewarding responsible cattle ranchers and farmers; improved enforcement of environmental laws; and investments in protected area management. This estimate utilizes a sophisticated economic model of the Amazon region that estimates and maps the value of forgone profits from ranching and soy farming that are associated with forest conservation.

Britaldo Soares-Filho of the Universidade Federal de Minas Gerais, the article's second author, describes, "Our economic models integrate the best available information on soils, roads, and the costs of production to capture the economic logic of the Amazon's drivers of deforestation."Brazil has emerged as one of the most progressive nations in the world in assuming commitments to lower greenhouse gas emissions within the United Nations climate negotiations. In December of 2008, this nation declared that it would cut deforestation to 20% of its historic level by 2020. Brazil's position going into Copenhagen next week, when climate negotiations should culminate in a new climate agreement, could be even more progressive.

Paulo Moutinho, leader of IPAM's climate change program, in Brazil, and a scientist at the WHRC, states, "Brazil was, for many years, the country that said that rich nations must lead in developing a solution to climate change. Now, Brazil is showing that leadership." These lessons are key, especially in light of the UN climate conference beginning on December 7, in Copenhagen, Denmark.

**Story Source:**

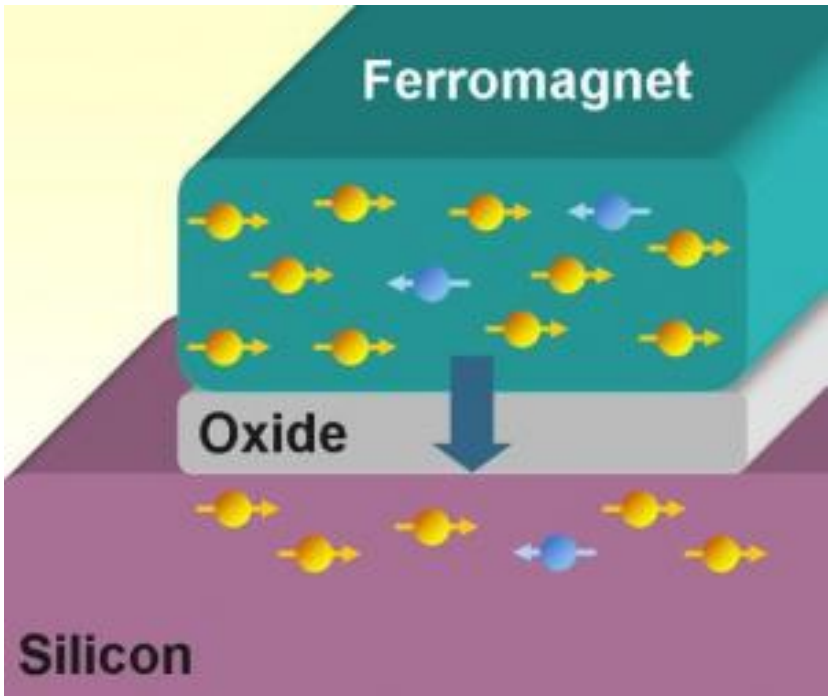
Adapted from materials provided by Woods Hole Research Center, via EurekAlert!, a service of AAAS.

**Journal Reference**:

1. Daniel Nepstad et al. **The End of Deforestation in the Brazilian Amazon**. *Science*, December 4, 2009

http://www.sciencedaily.com/releases/2009/12/091203163148.htm

**Breakthrough in 'Spintronics' Could Lead to Energy Efficient Chips**




*Silicon spin sandwich. (Credit: Image courtesy of University of Twente)*

ScienceDaily (Dec. 7, 2009) — Scientists from the MESA Institute for Nanotechnology of the University of Twente and the FOM Foundation have succeeded in transferring magnetic information directly into a semiconductor. For the first time, this is achieved at room temperature. This breakthrough brings the development of a more energy efficient form of electronics, so-called 'spintronics' within reach. The results are published on November 26 in *Nature*.

So far, information exchange between a magnetic material and a semiconductor was only possible at very low temperature. The successful demonstration of information exchange at room temperature is a pivotal step in the development of an alternative paradigm for electronics. The main advantage of this new 'spintronics' technology is the reduced power consumption: in present-day computer chips, excessive heat production is already a problem, and this will soon become a limiting factor.

**Digital by nature**

Unlike conventional electronics that employs the charge of the electron and its transport, spintronics exploits another important property of the electron, namely the 'spin'. The sense of rotation of an electron is represented by a spin that either points up or down. In magnetic materials, the spin orientation can be used to store a bit of information as a '1' or a '0'. The challenge is to transfer this spin information to a semiconductor, such that the information can be processed in new spin-based electronic components. These are expected to operate at lower power consumption, since computations such as reversing the electron spin, require less power than the usual transport of charge.

**Only a few atomic layers thick**

To achieve an efficient information exchange, the researchers insert an ultra thin -- less than one nanometer thick -- layer of aluminum oxide between the magnetic material and the semiconductor: this corresponds to only a few atomic layers. The thickness and quality of this layer are crucial. The

information is transferred by applying an electric current across the oxide interface, thereby introducing a magnetization in the semiconductor, with a controllable magnitude and orientation.

Importantly, the method works for silicon: the prevalent electronic material for which highly advanced fabrication technology is available. The researchers found that the spin information can propagate into the silicon to a depth of several hundred nanometers. This is sufficient for the operation of nanoscale spintronic components, according to researcher Ron Jansen. Now the next step is: to built new electronic components and circuits and use these to manipulate spin information.

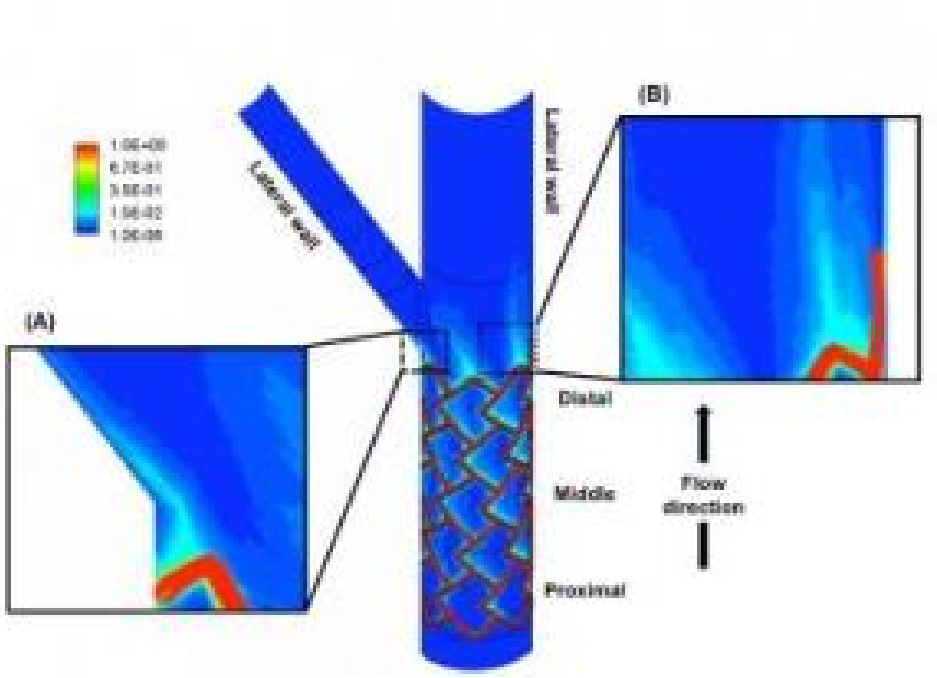
The spintronics research is performed by a team of researchers led by Ron Jansen at the MESA+ Institute for Nanotechnology, and is made possible by financial support from the Foundation FOM and a VIDI-grant received from the Netherlands Organization for Scientific Research (NWO).

**Story Source:**

Adapted from materials provided by University of Twente.

http://www.sciencedaily.com/releases/2009/11/091127124519.htm

**New Computer Model Could Lead to Safer Stents**




*Increased drug deposition along the flow direction on the lateral walls of the bifurcating vessel. Insets show high magnification images of drug pattern on the lateral wall (A) of the side-branch and opposite to the flow divider (B), respectively. Credits - Images: (Credit: Elazer Edelman, Vijaya Kolachalama and Evan Levine)*

ScienceDaily (Dec. 7, 2009) — MIT scientists including Elazer R. Edelman, the Thomas D. and Virginia W. Cabot Professor of Health Science and Technology (HST), and HST postdoctoral associate Vijaya B. Kolachalama, developed computer models to predict physiologically realistic drug delivery patterns from stents in branched arterial vessels. They simulated several arterial settings to show that drug distribution in these situations is determined by a complex calculation of the stent's position relative to arterial branches and constant blood flow changes caused by the branching.

"We now demonstrate for the first time that spatial variation in drug distribution can be significant when appreciated from a three-dimensional perspective and this viewpoint can only be gained with the use of these model systems," said Edelman.

Drug-eluting stents are now widely used all over the world to treat obstructive arterial disease, yet some patients with the stents have suffered life-threatening side effects: an increase risk of blood clotting and heart attacks. Several important questions remain unanswered -- in particular, the mechanisms that govern drug delivery to specific lesion sites are poorly defined and pose challenges for stent designers, physicians, and regulatory agencies that must evaluate stents' safety and efficacy.

Predicting drug distribution is complicated by the branching of arteries into two or more vessels, which establishes alterations in flow, wall shear stress and geometries. All of those can be modeled and defined mathematically, however, the variations cannot be captured across the full spectrum of perturbations and combinations in animal systems or in the lab, let alone the human. Computational models are therefore required.

"By observing the arterial drug distribution patterns for various settings, we understood that drug released from the stent does not reach uniformly to all regions of the vessel and this non-uniformity depends on where the stent is placed in the artery as well as the blood flow that is entering the vessel," says Edelman.

"Appreciating this phenomenon for more complex cases like branched vessels is non-intuitive, but now we have a computer model that gave us the much needed insight."

"Modeling stent-based drug delivery in branched vessels is critically important because these are frequent sites of arterial disease and yet there are no dedicated devices that are FDA-approved or efficient strategies using multiple stents to specifically treat these locations," says Kolachalama. "Our computer model shows that for some arterial settings, a single stent in the main-branch of the fork can provide drug to the side-branch. This observation could be important to consider, especially when one has to place stents in both branches."

How they did it: The computer model was generated by combining principles of digital image processing and parametric computer-aided geometry design with computational fluid dynamics and mass transport. A video link showing how these geometry models are created can be found on the journal website. The authors believe this modeling technique can be extended to simulate several settings with various stent designs as well as complex arterial geometries with and without disease, altered flow environments and other boundary conditions.

**Story Source:**

Adapted from materials provided by Massachusetts Institute of Technology.

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**Journal Reference**:

1. Vijaya Kolachalama, Evan Levine, Elazer Edelman. **Luminal Flow Amplifies Stent-Based Drug Deposition in Arterial Bifurcations**. *PLoS ONE*, 2009; 4 (12): e8105 DOI: 10.1371/journal.pone.0008105

http://www.sciencedaily.com/releases/2009/12/091202153758.htm

**Undocumented Volcano Contributed to Extremely Cold Decade from 1810-1819**

*SDSU Professor Jihong Cole-Dai and his colleagues studied ice cores from Antarctica and Greenland and found evidence of a previously undocumented volcanic eruption exactly 200 years ago that contributed to the record cold decade of 1810-1819. (Credit: Image courtesy of South Dakota State University)*

ScienceDaily (Dec. 7, 2009) — South Dakota State University researchers and their colleagues elsewhere in America and in France have found compelling evidence of a previously undocumented large volcanic eruption that occurred exactly 200 years ago, in 1809. The discovery helps explain the record cold decade from 1810-1819.

Researchers made the finding by analyzing chemicals in ice samples from snow-capped Antarctica and Greenland in the Arctic. The year-by-year accumulation of snow in the polar ice sheets records what is going on in the atmosphere.

"We found large amounts of volcanic sulfuric acid in the snow layers of 1809 and 1810 in both Greenland and Antarctica," said Professor Jihong Cole-Dai of SDSU's Department of Chemistry and Biochemistry, the lead author in an article published Oct. 25, in the scientific journal *Geophysical Research Letters*.

Cole-Dai said climate records show that not only were 1816 -- the so-called "year without a summer" -- and the following years very cold, the entire decade of 1810-1819 is probably the coldest for at least the past 500 years.

Scientists have long been aware that the massive and violent eruption in 1815 of an Indonesian volcano called Tambora, which killed more than 88,000 people in Indonesia, had caused the worldwide cold weather in 1816 and after. Volcanic eruptions have a cooling effect on the planet because they release sulfur gases into the atmosphere that form sulfuric acid aerosols that block sunlight. But the cold temperatures in the early part of the decade, before that eruption, suggest Tambora alone could not have caused the climatic changes of the decade.

"Our new evidence is that the volcanic sulfuric acid came down at the opposite poles at precisely the same time, and this means that the sulfate is from a single, large eruption of a volcano in 1809," Cole-Dai said. "The Tambora eruption and the undocumented 1809 eruption are together responsible for the unusually cold decade."

Cole-Dai said the Tambora eruption was immense, sending about 100 million tons of sulfur gas into the atmosphere, but the ice core samples suggest the 1809 eruption was also very large -- perhaps half the size of Tambora -- and would also have cooled the earth for a few years. The researchers reason that, because the sulfuric acid is found in the ice from both polar regions, the eruption probably occurred in the tropics, as Tambora did, where wind patterns could carry volcanic material to the entire world, including both poles.

Cole-Dai said the research specifically looked for and found a special indicator of sulfuric acid produced from the volcanic sulfur gas in the stratosphere.

The special indicator is an unusual make-up of sulfur isotopes in the volcanic sulfuric acid. Isotopes are different types of atoms of the same chemical element, each having a different number of neutrons, but the same number of protons. The unique sulfur isotope composition is like a fingerprint of volcanic material that has reached the stratosphere, said Cole-Dai.

The stratosphere is the second major layer of the Earth's atmosphere, reaching from about six miles to about 30 miles above the Earth's surface at moderate latitudes. To impact global climate, rather than local weather, the sulfur gas of a volcanic eruption has to reach up into the stratosphere and once there, be spread around the globe.

Cole-Dai's co-authors of the article are SDSU post-doctoral researcher David Ferris and graduate student Alyson Lanciki; Joël Savarino of the Laboratoire de Glaciologie et Géophysique de l'Environment in Grenoble, France; Mélanie Baroni of CEREGE (Le Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement) at L'Université Paul Cézanne in Aix-en-Provence, France; and Mark H. Thiemens of the University of California, San Diego.

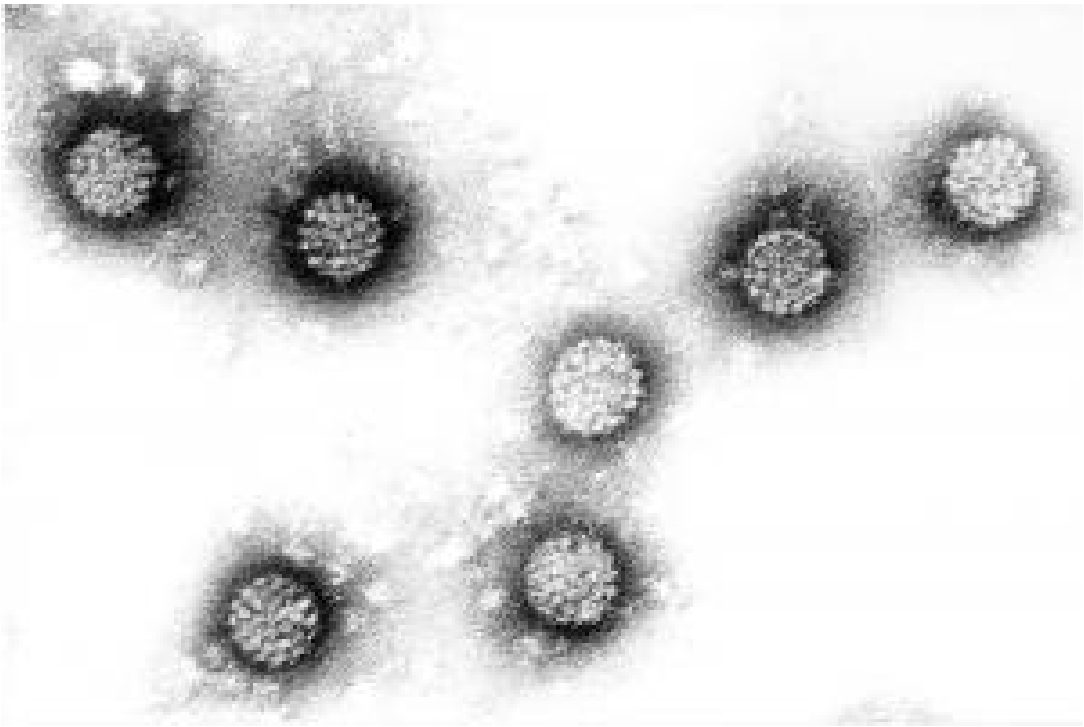
The National Science Foundation funded the research.

**Story Source:**

Adapted from materials provided by South Dakota State University, via Newswise.

http://www.sciencedaily.com/releases/2009/12/091205105844.htm

**Papillomavirus Silences Innate Immune Response**



*Scientists have discovered a mechanism by which the E6 oncoprotein of high-risk HPV16 promotes carcinogenesis. (Credit: Image courtesy of Helmholtz Association of German Research Centres)*

ScienceDaily (Dec. 7, 2009) — In the 1980s, Harald zur Hausen and his co-workers discovered that specific types of human papillomavirus (HPV) cause cervical cancer. Scientists soon found out how these pathogens cause cells to degenerate. It is known today that the main culprits are viral proteins E6 and E7. Both proteins switch off different cellular control functions, thus promoting cell growth.

Professor Dr. Frank Rösl and his co-workers at DKFZ have now discovered another mechanism by which the E6 oncoprotein of high-risk HPV16 promotes carcinogenesis. The oncogene silences production of an immune protein called interferon-kappa. Interferons are proteins which are part of our immune system and are responsible primarily for stimulating the immune response to viruses and tumors. Interferons are produced by white blood cells and other cell types. Interferon-kappa is relevant for HPV infections, because it is produced mainly in cells of the skin and mucosa (keratinocytes) which are the preferred hosts of the viruses. If interferon-kappa is not working in cells, other proteins involved in immune defense also cease to function properly.

Dr. Bladimiro Rincon-Orozco of Rösl's team has now shown for the first time that HPV16 switches off the interferon-kappa gene by biochemical modification of DNA. Such alterations of the genetic material are called epigenetic mutations. Studying HPV infected cells in a culture dish, the research team observed that interferon-kappa is epigenetically silenced. They were later able to confirm this result in cervical cancer tissue samples.

"Interferon-kappa is an important part of what is called innate immunity," Frank Rösl explains. Using this evolutionary old defense mechanism, the body can defend itself immediately after being infected with pathogenic agents, while formation of the specific "acquired" immune system may take some time. "By switching off the interferon production, the viruses prevent infected cells from being destroyed by this type of immune response," says Rösl, explaining the strategy of the virus that causes cancer. In the next step, the researchers are planning to investigate whether administering interferon-kappa can slow down the growth of cervical cancer cells and may thus support treatment of the disease.

**Story Source:**

Adapted from materials provided by Helmholtz Association of German Research Centres, via EurekAlert!, a service of AAAS.

**Journal Reference**:

1. Bladimiro Rincon-Orozco, Gordana Halec, Simone Rosenberger, Dorothea Muschik, Ingo Nindl, Anastasia Bachmann, Tina Maria Ritter, Bolormaa Dondog, Regina Ly, Franz X. Bosch, Rainer Zawatzky und Frank Rösl:. **Epigenetic Silencing of Interferon-%u03BA in Human Papillomavirus Type 16-Positive Cells**. *Cancer Res*, 2009; 69: (22) November 15, 2009

http://www.sciencedaily.com/releases/2009/12/091203112155.htm

**Cosmic Rays Hunted Down: Physicists Closing in on Origin of Mysterious Particles**

*M82, or the Cigar Galaxy, is a starburst galaxy about 12 million light-years away from Earth. In the galaxy's center, stars are being born 10 times faster than they are inside the entire Milky Way galaxy. The high stellar birth and death rate made M82 a good test case for the theory that cosmic rays are generated in supernovae explosions. In this false-color image, X-ray data recorded by the Chandra X-ray observatory is blue; infrared light recorded by the Spitzer infrared telescope is red; Hubble space telescope observations of hydrogen line emission is orange, and the bluest visible light is yellow-green. (Credit: NASA/JPL-Caltech/STScl/CXC/UofA/ESA/AURA/JHU)*

ScienceDaily (Dec. 7, 2009) — A thin rain of charged particles continually bombards our atmosphere from outer space. The mysterious particles were first detected 100 years ago but until 10 years ago when a new type of telescope began to come online physicists weren't sure where the "cosmic rays" came from or how they were generated. They suspected the particles were accelerated by supernova shockwaves, but suspicions aren't proof.

Imaging atmospheric Cherenkov telescopes now keeping a watchful eye on the night skies are finally providing the evidence needed to solve this longstanding puzzle. Over the past several years, observations of individual supernovae remnants in our galaxy have gradually strengthened the case for supernova acceleration.

But this fall the evidence suddenly got much stronger. The VERITAS consortium reported their observations of a starburst galaxy. This time the physicists were observing many supernovae at once instead of one by one. As they reported in *Nature*, the correlation between the high cosmic-ray density in the core of this galaxy and its high supernova rate provides powerful evidence in support of the theory of supernova acceleration.

Six of the papers co-authors are physicists at Washington University in St. Louis, one of the founding groups in the VERITAS consortium, a collaboration of 22 institutions that runs a four-telescope array in

the Santa Rita foothills south of Tuscon. The last of the three major imaging atmospheric Cherenkov arrays to come online (the other two are MAGIC in the Canary Islands, H.E.S.S. in Namibia), VERITAS saw "first light" in September 2007, just two years ago.

**Cosmic rays discovered**

It all began nearly 100 years ago with a tenacious response to what most people would have considered a passing irritation. The Viennese physicist Victor Hess wanted to know why an instrument used to measure radiation, called a gold-leaf electroscope, would slowly discharge even when there was no obvious source of radiation nearby. What was ionizing the air within the instrument case and letting the charge leak away?

To figure out where the radiation was coming from, Hess made balloon ascents in 1911 and 1912, carrying electroscopes with him. He expected the instruments would discharge more slowly at higher altitudes. Instead, he found that they discharged more rapidly.

Hess decided the radiation was coming from outer space and named it cosmic radiation. He won the Nobel Prize in physics in 1936 for his discovery.

**Why it took so long**

The famous American physicist Robert Millikan called Hess's penetrating radiation "cosmic rays," but "rays" is a misnomer. The "rays" are not light but instead are atomic nuclei, mostly hydrogen nuclei, or protons, with a sprinkling of helium and heavier nuclei.

Unlike light, these particles carry electric charge. And that's a problem because space is laced by magnetic fields, and charged particles spiral around magnetic field lines. These deflections and detours so tangle the particles' paths that by the time they arrive at Earth they appear to be arriving in equal numbers from all directions.

Because the rays themselves don't point back to their sources, astronomers have to track them down by other means. When cosmic rays collide with other atomic nuclei in gas or dust, they produce gamma rays, which are a kind of high-energy light. The gamma-ray portion of the electromagnetic spectrum covers a lot of territory, but some of the most energetic gamma rays have trillions of times the energy of the light we can see.

Because gamma rays travel in straight lines physicists can trace them backward -- with luck to objects that can be observed with conventional telescopes at other wavelengths.

But there is another obstacle to overcome. Gamma rays make it nearly to Earth but not quite. They can't penetrate the atmosphere, and so, like cosmic rays, they must also be detected indirectly.

When a very energetic gamma-ray interacts with an atom in the upper atmosphere, the collision can result in debris in the form of a pair of particles: an electron and its antiparticle, the positron. The debris from this collision can interact with another atom yielding more electrons, positrons and photons in an avalanche that results in a cascade of billions of particles called an extensive air shower."

Because the particles are traveling faster than the speed of light in the atmosphere, they create a shock wave similar to the sonic boom from a supersonic jet. The shock wave takes the form of a cone of bluish light known as Chernekov radiation. (The blue glow of the cooling water in a nuclear reactor is created by the same process.)

The flashes of light from an extensive air shower are so faint and brief they can't be seen with the unaided eye. To record them, Chernekov telescopes like VERITAS use extremely sensitive and fast "cameras" made of hundreds of photomultiplier tubes.

The Washington University group founded by James H. Buckley, Ph.D., professor of physics in Arts & Sciences and a member of the McDonnell Center for the Space Sciences at the University, designed and built the high-speed electronics capable of making "movies" of the flashes at a blistering half a billion frames per second. The frame rate of a standard movie camera, by contrast, is 24 frames per second.

The four telescopes in the VERITAS array each provide a different view of an air shower, providing a better fix on the direction of the incoming gamma ray.

**Accelerators in space**

Scientists knew from the start that cosmic radiation had to come from unusual astrophysical sources. Cosmic rays are what is called non-thermal radiation. That is, you can't get this kind of radiation just by heating something up, even to the nuclear furnace temperatures of stellar interiors.

Instead, to make cosmic rays, you need something more like a particle accelerator. But the world's highest-energy accelerator is designed to boost protons to an energy of only a few tera-electron-Volts, and by the standards of cosmic rays, that's nothing. Some of them have energies 100 million times higher.

An accelerator works by using electromagnetic fields to continually kick particles confined to a ring to higher and higher energies. To get up to cosmic ray energies, however, the particles would have to be subject to very strong electromagnetic fields over enormous distances. So, at a minimum, cosmic accelerators must be huge and exceedingly violent objects.

And that's more or less what VERITAS and the other telescopes are finding them to be.

**A supernova remnant**

Even before all four telescopes were up and running, the VERITAS array was used to observe IC 443, also known as the Jellyfish nebula, a galactic supernova remnant in the constellation Gemini.

IC 443 is thought to be the remains of a star that blew itself apart thousands of years ago. The massive explosion left behind the collapsed remnant of the star's core, in the form of a spinning neutron star, and a rapidly expanding shell of gas.

When material speeding out from the supernova hit the interstellar medium, it created a shock wave. In the southeast corner of the nebula the shock wave is slamming into a dense molecular cloud, perhaps the cloud from which the star originally condensed.

VERITAS found that high energy gamma-ray emission was confined to a region in the remnant where the molecular cloud was thickest.

It seemed the shock wave was acting as a gigantic accelerator, and gamma rays were being unleashed when protons energized by the shock front struck the nearby molecular cloud.

This interpretation of the results made sense, but was it true?

The physicists weren't entirely sure.

For one thing, energetic electrons as well as atomic nuclei can produce gamma rays. Electrons accelerated to high energies by the supernova might be colliding with low-energy photons, boosting them to gamma-ray energies. This is called the inverse Compton effect.

Arthur Compton described the opposite process -- in which high energy photons collide with stationary particles -- while at Washington University, work for which he won the Nobel Prize in physics in 1927. The theory of the inverse effect was first set out by two of Compton's colleagues at the University, Eugene Feenberg and Henry Primakoff, in 1948.

But Buckley and his colleagues were also aware that one observation was not much to go on. It was possible that supernova remnant IC 443 wasn't typical but rather somehow anomalous or unusual.

Since 2007, VERITAS has taken gamma-ray snapshots of other supernova remnants, including Boomerang and gamma Cygni, observed just this summer. They show much the same gamma-ray emission as IC 443.

**Many supernovae at once**

The latest find, announced Nov. 1 in the online journal *Nature*, is qualitatively different. This time the telescopes were looking at the diffuse gamma-ray emission from an entire galaxy, one that has many supernova remnants.

They were looking at an entire forest instead of a single tree.

The galaxy is M82, a starburst galaxy five times brighter than the entire Milky Way. There are many starburst galaxies, says Henric Krawczynski, Ph.D., associate professor of physics and a member of the McDonnell Center for the Space Sciences, who together with Buckley, has led many of the VERITAS scientific programs, "but we chose to observe M82 because it is close to our Milky Way galaxy and combines a high rate of star formation with a high density of interstellar matter. "

M82 is also called the cigar galaxy because it was deformed into a long, fat slug by a collision with a nearby galaxy. The encounter funneled gas into the galaxy's core, creating a compact region where stars are being formed about 10 times faster than in the Milky Way and supernova pop off with alarming frequency.

The ferment of stellar explosions, the astronomers reasoned, should be churning out cosmic rays and gamma rays.

Not that the gamma rays would be easy to see, because the supernovae in the starburst galaxy are much farther away than IC 443 or other supernovae in our galaxy. Although VERITAS is presently the most sensitive gamma-ray observatory in the world, it took almost two years of repeated observations to detect the predicted signal.

But the data, once gathered, indicated that the starburst region of M82 has a cosmic ray density 500 times the average cosmic ray density of our galaxy. Its estimated supernova rate is about 30 times higher than the Milky Way's. The correlation between the cosmic-ray density and the supernova rate strongly supports the long-held theory that supernovae are cosmic ray factories.

**What they know and when they knew it**

So do physicists feel they now know where and how cosmic rays are generated?

Buckley's response is carefully worded. "After all of these years, we're starting to see evidence both from discrete sources-- the supernova remnants-- and at the galactic scale--the starburst galaxy--that supernova explosions are really the source of cosmic rays."

"If we finally see neutrinos coming from the sources," he says, "then we'll know absolutely that protons, not electrons, are producing the gamma rays, because only the protons will give you neutrinos."

"But even if we knew where they're coming from, we wouldn't know the exact mechanism by which they're accelerated," he continues. "That shock acceleration idea is very nice, but there are problems with it and ultimately the devil is in the details."

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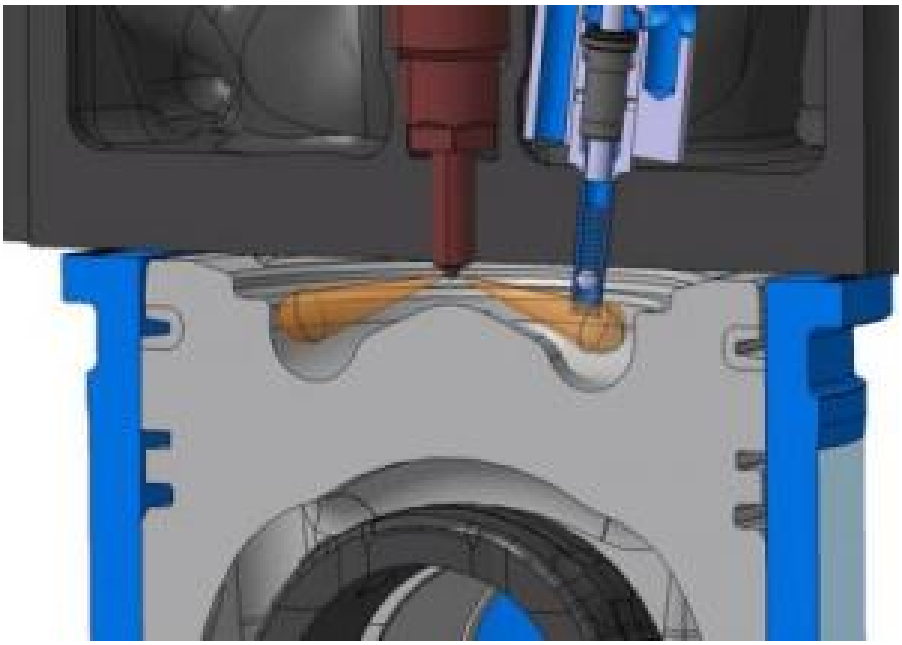
**Story Source:**

Adapted from materials provided by Washington University in St. Louis, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/12/091207123810.htm

**Diesel Truck Engine Made With Barely Measurable Emissions**



*This illustration shows a gas-sampling valve (top half of picture, blue) in a low-emission diesel test engine at the Technische Universitaet Muenchen. The valve (blue, with spring) shoots into the combustion chamber and takes a sample of the exhaust gases (brown) within a fraction of a second. (Credit: Sebastian Pflaum, TU Muenchen)*

ScienceDaily (Dec. 7, 2009) — Just three months after the Euro 5 Norm for exhaust emissions went into force for all new car models, researchers at the Technische Universitaet Muenchen (TUM) have demonstrated an engine that is already close to meeting the more stringent Euro 6 emissions standard. A research team headed by Prof. Georg Wachtmeister from the Chair of Internal Combustion Engines has succeeded in reducing the pollutants in exhaust emissions to barely measurable levels.

The TUM engineers have also developed a probe that allows them to take samples directly from the combustion chamber while the engine is running. With this method they hope to discover precisely how soot forms, with the aim of developing new methods for emissions control.

In a hall at the TUM Chair of Internal Combustion Engines (LVK) the smell of exhaust fumes is barely discernable, even though the two-ton LVK research engine is running at full power. The engine is the centerpiece of the research project NEMo (Niedrigst-Emissions-LKW-Dieselmotor), the German acronym for "lowest emission truck diesel engine." The researchers want to design and fine-tune their engine so that it complies with the Euro 6 caps -- without resorting to a catalytic converter.

The Euro 6 Norm, scheduled to come into force by 2014, is a tough standard by any measure. The directive stipulates emission levels that are barely measurable. A diesel engine, for instance, may emit a mere 5 milligrams of soot particles and 80 milligrams of nitrogen oxides per kilometer. That is a fifth of the soot and a quarter of the nitrogen oxides allowed by the Euro 4 Norm that was valid until August, and less than half of the nitrogen oxides permitted by the Euro 5 Norm.

However, a reduction in emissions is complicated by the fact that nitrogen oxides and soot particles cannot be reduced independently of each other.

Nitrogen oxides are formed in an engine when diesel fuel burns in the air of the combustion chamber. Air consists of 21 percent oxygen and 78 percent nitrogen. Diesel fuel reacts with oxygen, producing carbon

dioxide and water. This happens in a very fast reaction resulting in combustion chamber temperatures so high that the oxygen also starts to react with the nitrogen in the air, forming nitrogen oxides.

To combat this effect, modern diesel engines recirculate part of their exhaust back into the combustion chamber after cooling it down, together with the fresh air. In this mixture, carbon dioxide and water from the exhaust gases moderate the combustion process, keeping the temperature in check. As a result, fewer nitrogen oxides are formed, albeit at the price of increased soot production since the proportion of oxygen in the air-exhaust mixture is lower.

The TUM researchers designed the LVK test engine in such a way that the air-exhaust mixture is injected into the combustion chamber under high pressure. The engine's turbo-charger compresses the mixture to ten times atmospheric pressure (measured in bar) -- more than double the pressure mass-production vehicle engines can handle. Compressed in this way, the air-exhaust mixture contains enough oxygen for the diesel fuel to burn completely.

They coupled this innovation with another improvement, at the nozzle that injects diesel fuel into the combustion chamber. It atomizes the fuel into microscopic droplets, allowing them to burn completely. In larger droplets produced by conventional injectors, only the outer layer of fuel molecules are burned, like an onion whose first layer has been peeled. The resulting exhaust fumes envelop the fuel droplets, shielding them from the oxygen. The shell of exhaust gases gets increasingly dense with each "onion layer" that goes up in flames. Eventually it becomes practically impossible for oxygen to react with the fuel. The result: soot formation.

The NEMo injector nozzle atomizes diesel fuel at a pressure of over 3000 bar -- standard is 1800 bar, at most -- to generate a fuel mist that burns very quickly and practically soot-free. Unfortunately, this also results in surging temperatures; a tricky situation, and finding the right balance between the three parameters of exhaust gas recirculation, boost pressure, and nozzle configuration proved challenging indeed.

Yet the engineers at the Chair of Internal Combustion Engines at the TUM are not content with fulfilling the Euro 6 Norm. They want to find out precisely how soot is formed in the split seconds during which the fuel droplets burn up. Simply placing a probe in the combustion chamber would disturb the combustion process. To surmount this problem the researchers constructed a tiny pipe that is shot into the center of the combustion chamber at lightning speed. The gas-sampling valve needs only one millisecond to take a sample before leaving the combustion chamber again. Using this method, 13 samples can be taken during a single ignition -- an ideal situation for studying the growth of soot particles and developing engines with even lower emissions.

**Story Source:**

Adapted from materials provided by Technische Universitaet Muenchen.

http://www.sciencedaily.com/releases/2009/12/091207095514.htm

**Computer Screen Pop-Ups May Slow Down Your Work More Than You Think**

ScienceDaily (Dec. 7, 2009) — Computer screen pop-ups may slow down your work more than you think, according to new research. Although the actual interruption may only last a few moments, the study shows that we then lose more time when we try to find our place and resume the task that was interrupted.

The research, led by Dr Helen Hodgetts and Professor Dylan Jones at Cardiff University, examined the cost of on-screen interruptions in terms of the time taken to complete a simple seven-step computer task.

The researchers found that, even after only a five second interruption, people take longer than normal to complete the next step in the task they are working on.

"The interruption breaks our cognitive focus on the task in hand, so we have to work out where we were up to and what we were planning to do next before we can resume the task at our original speed" explains Dr Hodgetts.The interruptions only caused a few seconds delay in resuming the simple task set in the experiments but in a more realistic work environment, where there is more information to retrieve after the interruption, the loss of concentration could have a greater impact on work performance.

"Our findings suggest that even seemingly brief and inconsequential on-screen pop-up messages might be impacting upon our efficiency, particularly given their frequency over the working day," says Dr Hodgetts.Other results from the study show that an interruption lag -- a brief time between a warning for an upcoming interruption and the interruption itself- can reduce the time we lose trying to find our place again

A warning sound was found to be most effective because it allows us to consolidate where we are in the current task before transferring our attention to the interruption. In contrast, a flashing warning signal on the computer screen can be just as disruptive as the interruption itselfThe benefits of having time to rehearse our place or lay down mental 'cues' to help us back to where we were in a task (before we divert our attention to deal with an interruption) has practical implications for the design of computer pop-ups.

The researchers suggest that e-mail alerts and similar pop-up messages should be as small and discrete as possible and should not obscure the original activity. Better still, any visual alert should disappear after a few seconds if not responded to, so that we can be aware that there is incoming information without having to interrupt our current task.The researchers also point out obvious practical steps that computer users can take to minimise unscheduled pop-up notifications, particularly whilst engaging in tasks that require a lot of planning or concentration:

Instant-messenger systems should be turned off or at least set to 'busy' so that colleagues are aware that unimportant interruptions are not welcome; and e-mail alerts could be turned off or only enabled for messages that the sender tags specifically as high priority.These findings are from 'Now where was I? Cognitive models and support mechanisms for interrupted task performance' a study funded by the Economic and Social Research Council. The research was carried out by Dr Helen Hodgetts, Professor Dylan Jones and Dr Tom Freeman at the School of Psychology, Cardiff University.

Methodology: The experiments used a 3-disk Tower of Hanoi problem-solving task. In this task, participants are presented with a starting array of 3 rods and three different sized disks stacked in order of size on one rod. To solve the problem, participants must move all the disks to another rod without placing a larger disk onto a smaller one, using the minimum number of moves (in this case seven).

**Story Source:**

Adapted from materials provided by Economic & Social Research Council.

http://www.sciencedaily.com/releases/2009/12/091207095511.htm

**Brain Waves Can 'Write' on a Computer in Early Tests, Researchers Show**

*Feedback from electrodes placed directly on the brain is much more specific than data collected from electroencephalography (EEG), in which electrodes are placed on the scalp (shown above). (Credit: iStockphoto)*

ScienceDaily (Dec. 7, 2009) — Neuroscientists at the Mayo Clinic campus in Jacksonville, Fla., have demonstrated how brain waves can be used to type alphanumerical characters on a computer screen. By merely focusing on the "q" in a matrix of letters, for example, that "q" appears on the monitor.

Researchers say these findings, presented at the 2009 annual meeting of the American Epilepsy Society, represent concrete progress toward a mind-machine interface that may, one day, help people with a variety of disorders control devices, such as prosthetic arms and legs. These disorders include Lou Gehrig's disease and spinal cord injuries, among many others.

"Over 2 million people in the United States may benefit from assistive devices controlled by a brain-computer interface," says the study's lead investigator, neurologist Jerry Shih, M.D. "This study constitutes a baby step on the road toward that future, but it represents tangible progress in using brain waves to do certain tasks."

Dr. Shih and other Mayo Clinic researchers worked with Dean Krusienski, Ph.D., from the University of North Florida on this study, which was conducted in two patients with epilepsy. These patients were already being monitored for seizure activity using electrocorticography (ECoG), in which electrodes are placed directly on the surface of the brain to record electrical activity produced by the firing of nerve cells. This kind of procedure requires a craniotomy, a surgical incision into the skull.

Dr. Shih wanted to study a mind-machine interface in these patients because he hypothesized that feedback from electrodes placed directly on the brain would be much more specific than data collected from electroencephalography (EEG), in which electrodes are placed on the scalp. Most studies of mind-machine interaction have occurred with EEG, Dr. Shih says.

"There is a big difference in the quality of information you get from ECoG compared to EEG. The scalp and bony skull diffuses and distorts the signal, rather like how the Earth's atmosphere blurs the light from stars," he says. "That's why progress to date on developing these kind of mind interfaces has been slow."

Because these patients already had ECoG electrodes implanted in their brains to find the area where seizures originated, the researchers could test their fledgling brain-computer interface.

In the study, the two patients sat in front of a monitor that was hooked to a computer running the researchers' software, which was designed to interpret electrical signals coming from the electrodes.

The patients were asked to look at the screen, which contained a 6-by-6 matrix with a single alphanumeric character inside each square. Every time the square with a certain letter flashed, and the patient focused on it, the computer recorded the brain's response to the flashing letter. The patients were then asked to focus on specific letters, and the computer software recorded the information. The computer then calibrated the system with the individual patient's specific brain wave, and when the patient then focused on a letter, the letter appeared on the screen.

"We were able to consistently predict the desired letters for our patients at or near 100 percent accuracy," Dr. Shih says. "While this is comparable to other researchers' results with EEGs, this approach is more localized and can potentially provide a faster communication rate. Our goal is to find a way to effectively and consistently use a patient's brain waves to perform certain tasks."

Once the technique is perfected, its use will require patients to have a craniotomy, although it isn't yet known how many electrodes would have to be implanted. And software would have to calibrate each person's brain waves to the action that is desired, such as movement of a prosthetic arm, Dr. Shih says. "These patients would have to use a computer to interpret their brain waves, but these devices are getting so small, there is a possibility that they could be implanted at some point," he says.

"We find our progress so far to be very encouraging," he says.

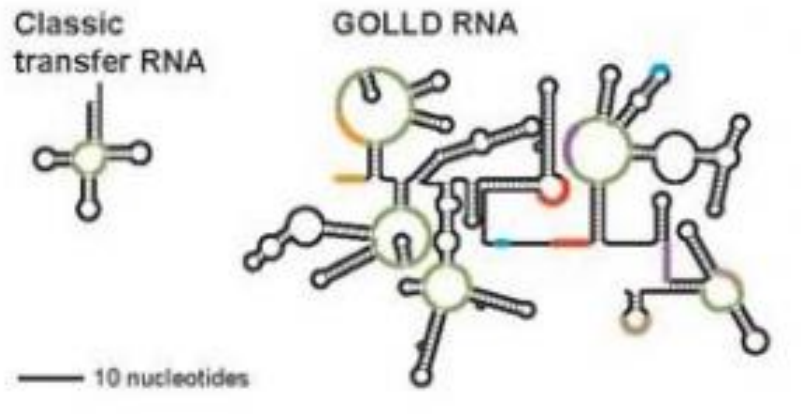
The study, which is funded by the National Science Foundation, is ongoing.

**Story Source:**

Adapted from materials provided by Mayo Clinic.

http://www.sciencedaily.com/releases/2009/12/091206181911.htm

**Newly Explored Bacteria Reveal Some Huge RNA Surprises**




*A representation of relative size of a typical RNA molecule involved in transfer of genetic information and newly discovered RNA molecule GOLLD, the third largest and most complex RNA discovered to date. GOLLD appears to be used by viruses that infect bacteria. (Credit: Image courtesy of Yale University)*

ScienceDaily (Dec. 7, 2009) — Yale University researchers have found very large RNA structures within previously unstudied bacteria that appear crucial to basic biological functions such as helping viruses infect cells or allowing genes to "jump" to different parts of the chromosome.

These exceptionally large RNA molecules have been discovered using DNA sequence data available within the past few years. The findings, reported in the December 3 issue of the journal *Nature*, suggest many other unusual RNAs remain to be found as researchers explore the genes of more species of bacteria, said Ronald Breaker, senior author of the paper and professor of Molecular, Cellular and Developmental Biology

"Our work reveals new classes of large RNAs exist, which would be akin to protein scientists finding new classes of enzymes," said Breaker, a Howard Hughes Medical Institute investigator. "Since we have only scratched the surface when it comes to examining microbial DNA that is covering the planet -- there will certainly be many more large RNAs out there to discover and these newfound RNAs are also likely to have amazing functions as well."

The RNA molecules rank among the largest and most sophisticated RNAs yet discovered and may act like enzymes or carry out other complex functions in bacteria. The RNAs are found in bacteria which have yet to be grown in labs and so have been difficult to study.

RNA, or ribonucleic acid, is a chemical related to DNA. (Move definition up) RNA molecules are best known for carrying information from genes encoded in DNA to ribosomes, which are the protein-manufacturing machines of cells. However, some RNAs are not passive messengers, but form intricate structures that function like enzymes. For example, ribosomes are constructed using the two largest structured RNAs in bacteria that together function as the chemical factory for producing proteins. Yale University's Thomas Steitz won the 2009 Nobel Prize for his work to solve the atomic-resolution structure of ribosomes from bacterial cells. His work helped prove that ribosomes stitch together amino acids to make proteins using large RNAs like enzymes.

Nearly all of the largest structured RNAs previously known had been discovered in the 1970s or earlier. The scientists discovered these new RNAs by analyzing genetic data from poorly studied bacteria that in

many cases cannot yet be grown in laboratory conditions. Only a tiny fraction of bacteria in the wild can now be grown in the lab, and scientists have only recently been able to collect genetic data from uncultivated bacteria. Consequently, there is a vast array of bacteria for which genetic data remains unavailable. Many other RNAs likely remain hidden in these under-studied bacteria that also have unusual characteristics that will greatly expand the known roles of RNA in biology.

The Breaker laboratory has used the explosion of DNA sequence information and new computer programs to discover six of the top twelve largest bacterial RNAs just in the last several years. One of the newly discovered RNAs, called GOLLD, is the third largest and most complex RNA discovered to date, and appears to be used by viruses that infect bacteria. Another large RNA revealed in the study, called HEARO, has a genetic structure that suggests it is part of a type of "jumping gene" that can move to new locations in the bacterial chromosome. They also found other RNAs in species of bacteria abundant in the open ocean, and some of these had been identified near Hawaii by researchers from the Massachusetts Institute of Technology. These RNAs are also very common in bacteria that live near the shore of the North American east coast, and so organisms that carry this RNA are likely to be very common in the waters of all the earth's oceans.

The research was funded by Howard Hughes Medical Institute and the National Institutes of Health.

**Story Source:**

Adapted from materials provided by Yale University.

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**Journal Reference**:

1. Weinberg et al. **Exceptional structured noncoding RNAs revealed by bacterial metagenome analysis**. *Nature*, 2009; 462 (7273): 656 DOI: 10.1038/nature08586

http://www.sciencedaily.com/releases/2009/12/091202131618.htm

**Stopping MRSA Before It Becomes Dangerous Is Possible**

*Sandia National Laboratories researcher Jeff Brinker sits next to a cell-suspension wheel that contains bacteria suspended in media. Brinker is also a professor at the University of New Mexico. (Credit: Photo by Randy Montoya)*

ScienceDaily (Dec. 7, 2009) — Most scientists believe that staph infections are caused by many bacterial cells that signal each other to emit toxins. The signaling process is called quorum sensing because many bacteria must be present to start the process.But the Jeff Brinker research group has determined that the very first stage of staph infection, when bacteria switch from a harmless to a virulent form, occurs in a single cell and that this individual process can be stopped by the application of a simple protein.

The Brinker group's nonantibiotic approach may make it easier to treat staphylococci strains that have become drug resistant like the methicillin-resistant *Staphylococcus aureus* MRSA. The control of such strains is a formidable problem in hospitals."The good news is that by inhibiting the single cell's signaling molecules with a small protein, we were able to suppress any genetic reprogramming into the bacterium's more virulent form," said Brinker. "Our work clearly showed the strategy worked."

Brinker, with appointments at Sandia National Laboratories and the University of New Mexico, wrote about his group's findings in the Nov. 22 issue of *Nature Chemical Biology*.

In the course of its experiments, the Brinker team achieved three firsts:

- They isolated *Staphylococcus aureus* bacteria in individual, self-assembled nanoscale compartments. Isolation of an individual bacterium previously had been achieved only computationally, leaving open questions of how a physically and chemically isolated bacterium would actually behave.
- They demonstrated that it was the release of signaling peptides from a single cell -- not a quorum -- that acted as a trigger to reprogram that same cell so that it released toxins.
- By introducing an inexpensive, very low-density lipoprotein (VLDL) to bind to the messenger peptide, they stopped the single cell from reprogramming itself.

The term "quorum sensing" itself may prove a misnomer, the result of observations made in cell cultures rather than in the body, said Brinker. Because signaling molecules tend to diffuse away, a liquid culture of cells would naturally require many bacteria to produce enough signaling bacteria to begin reprogramming. The situation is otherwise in nature, where even a single cell may be sufficiently isolated that its own manufactured peptides would remain in its vicinity.

"Also, it's hard to believe that one cell's evolution could be based on what a whole bunch of cells do," said Brinker. "When we instead consider that an individual cell will do what's best for it, we can more clearly understand the benefits of that cell's behavior."

A bacterium may live longer by reprogramming itself to produce toxins or enzymes that allow it to access external nutrients, the Brinker group showed.One aspect of experimental rigor was the team's ability to organize living cells into a nanostructured matrix. "We've already done this with yeast," said Brinker. "We just extended the process to bacteria."

A key question was whether a cell could distinguish between peptides emitted by itself from those sent by other cells. If signaling peptides were chemically the same, what would it matter which bacterium emitted it?

As it turned out, said Brinker, "Peptides could bond to surface receptors on their own [generating] cell. So a single cell's peptide molecules could activate its own genes to express proteins that make staph virulent."

Indicating that the experiment had isolated the actual cause of the transformation, when the number of peptides produced by a cell ultimately came to exceed the number of lippoprotein molecules in solution, a stalled "quorum-sensing" procedure started up again.

When still more signaling molecules were added to the mix, the cell's transformation occurred more rapidly.

Researchers hope to find a mechanism to locate bacteria reprogramming in the body so that the antidote can be delivered in time. The problem could be solved, suggested Brinker, by the insertion of VLDL-bearing nanospheres (another Brinker-group creation) into the bloodstream, linked to a 'searcher' molecule designed to find and link to suspect peptides or cells that produce them.

"Inhibiting this specific signaling molecule from turning on virulence wouldn't inhibit other bacteria," Brinker said.

Targeting is important because the human gastro-intestinal system contains many useful bacteria. These are often decimated by conventional antibiotics but would be spared by the Brinker group's method.

Brinker, a Sandia Fellow and distinguished professor of chemical engineering and molecular genetics and microbiology at UNM, performed this work with Eric Carnes and DeAnna Lopez at the UNM Department of Chemical and Nuclear Engineering (Lopez is now a Sandia technologist), Graham Timmins at the UNM College of Pharmacy, Niles Donegan and Ambrose Cheung at Dartmouth Medical School, and Hattie Gresham at the New Mexico Veterans Administration Health Care System.

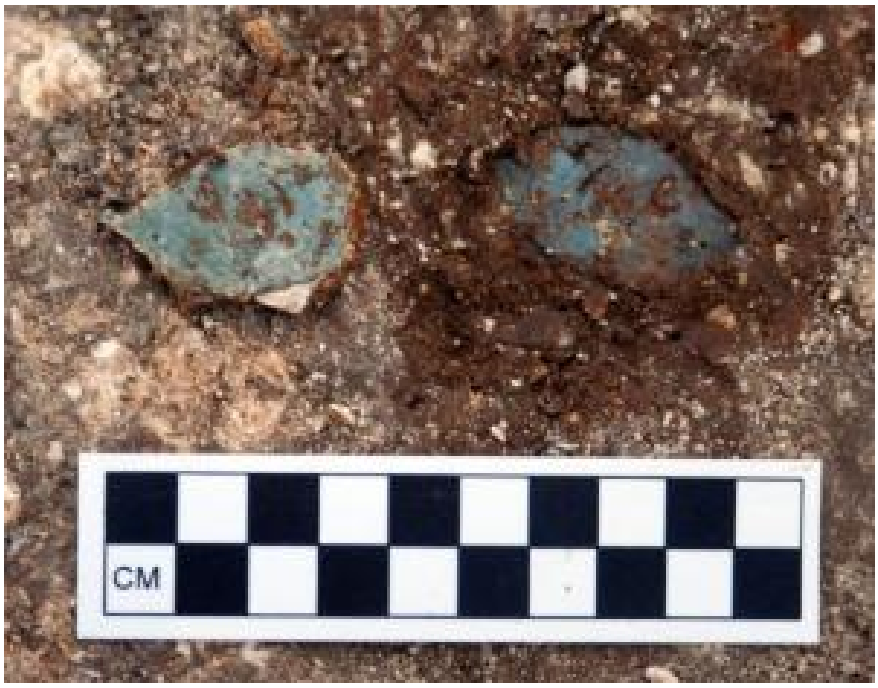
The Sandia work is supported by the Basic Energy Sciences / Division of Materials Science and Engineering and Sandia's Laboratory Directed Research and Development (LDRD) program. Other project work is supported by the Air Force Office of Scientific Research, the National Science Foundation, the Defense Threat Reduction Agency and the National Institutes of Health.

**Story Source:**

Adapted from materials provided by DOE/Sandia National Laboratories.

http://www.sciencedaily.com/releases/2009/12/091203132201.htm

**Remains Of Minoan-Style Painting Discovered During Excavations Of Canaanite Palace**




*"Blue fresco remains": Remains of blue Minoan-style fresco discovered at Tel Kabri excavations. (Credit: Image courtesy of University of Haifa)*

ScienceDaily (Dec. 7, 2009) — Tel Kabri is the only site in Israel where wall paintings similar in style to those found in the Aegean 3,600 years ago have been found; researchers say this was a conscious decision made by the city rulers to lean toward Mediterranean culture.

The remains of a Minoan-style wall painting, recognizable by a blue background, the first of its kind to be found in Israel, was discovered in the course of the recent excavation season at Tel Kabri. This fresco joins others of Aegean style that have been uncovered during earlier seasons at the Canaanite palace in Kabri. "It was, without doubt, a conscious decision made by the city's rulers who wished to associate with Mediterranean culture and not adopt Syrian and Mesopotamian styles of art like other cities in Canaan did. The Canaanites were living in the Levant and wanted to feel European," explains Dr. Assaf Yasur-Landau of the University of Haifa, who directed the excavations.

The remains of a Canaanite city from the Middle Bronze Age (2000-1550 B.C.) have been exposed at Tel Kabri, next to Kibbutz Kabri near Nahariya. A palace for the city's rulers stands in the center of the city, which was the most important of the cities in the Western Galilee during that period. Excavations began at Tel Kabri in 1986, conducted by the late Prof. Aharon Kempinski, and were halted in 1993. Over the past years, excavations have been renewed by teams directed by Dr. Yasur-Landau of the Leon Recanati Institute for Maritime Studies at the University of Haifa and Prof. Eric Cline of The George Washington University.

Tel Kabri is unique in that after the city was deserted, no other city was built over its remains. Therefore, this is the only Canaanite city that can be excavated in its entirety. The palace too, which has been measured with geophysical tools at 1 to 1.5 acres, is the only such palace of this period that can be excavated fully. "The city's preservation enables us to get a complete picture of political and social life in the Canaanite period. We can reveal whether or not it had a central government, whether taxes were levied, what sort of agriculture there was and how politics were conducted at the time," Dr. Yasur-Landau explains.

The recent excavation season has enabled researchers to conclude what the rulers' cultural preferences were. While excavations at Tel Hazor in the northern Galilee, the largest Canaanite city of that period, revealed numerous remains of sculpture works of Syrian and Mesopotamian style, no such evidence of this style of artwork were discovered at Tel Kabri. Until now the remains of a fresco in a style that had been common on the island of Santorini (Thera), discovered during previous seasons at the Tel Kabri site, might have been considered a solitary occurrence. However, the remains of additional works reinforce the conjecture that this was a city that not only had trade relations with Mediterranean kingdoms, but also preferred to be culturally associated with them. "Unlike Hazor, which held trading and cultural ties with Syria and Mesopotamia, the rulers of the city at Tel Kabri consciously chose the Mediterranean alternative, relating to Aegean cultures, which doubtlessly seemed more exotic to the local inhabitants," Dr. Yasur-Landau explains.

Additional findings during the past season illuminate other angles of day-to-day life in the Canaanite city. The researchers discovered that the rulers confiscated privately owned lands in order to build both the palace and a ceremonial path encircling the palace. The researchers also began digging a corridor that had been discovered last year and found tens of pottery vessels there, such as storage jars, shallow bowls, cups, and jugs. The corridor, which probably served as a storage area, was blocked off by the ancient inhabitants, and therefore remnants of the substances held in these pottery vessels still remains, as did many animal bones. "We sent the bones and substance remains to be examined, so we should soon be able to know more about the standard diet of that time and in this particular area," Dr. Yasur-Landau added.

**Story Source:**

Adapted from materials provided by University of Haifa, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2009/11/091109121119.htm

**Test 'reduces birth false alarms'**

**A simple test can help reliably determine whether signs of an imminent premature delivery are likely to result in a false alarm, research suggests.**

Less than half of women showing these signs actually go on to give birth soon after, and they often have to undergo what turn out to be unnecessary tests.

UK researchers found a test that looks for a protein called fetal fibronectin (fFN) could solve the problem.

The study was conducted by University College London.

" **Women with a negative test can be reassured that they do not need inpatient care** "
Dr Anna David University College London

Details were presented to a Royal College of Obstetricians and Gynaecologists conference.

fFN is the protein that helps attach the foetal sac, in which the foetus develops, to the uterus.

Previous research has shown that when fFN is found to be leaking at a certain stage of pregnancy, a premature birth is more likely.

A test to detect fFN levels is relatively cheap and easy to perform - but it is not commonly used in all maternity units.

It is done at the same time as a vaginal examination, which is routinely carried out when a woman is admitted with abdominal pain in pregnancy.

If the results show low levels of fFN, then the chance of a women having a premature delivery imminently is low.

**Drug intervention**

The researchers conducted an audit to determine whether use of the test made any significant difference.

Initially they analysed 22 cases of women admitted to hospital showing signs of being about to go into premature labour.

Of these, 17 did not give birth during their hospital stay, which averaged just more than eight days.

Most received steroid drugs to improve their baby's lung function, or tocolytic drugs to halt labour contractions.

The situation changed significantly after staff began to use the fFN test.

It proved to be 98.6% accurate in identifying women who, despite showing signs of premature delivery, did not go into labour for at least another two weeks.

As a result just seven women out of 78 who showed signs of being about to go into labour, but who registered low levels of fFN, required hospital treatment - for pain management.

Lead researcher Dr Anna David said: "Threatened pre-term labour often causes much anxiety for pregnant women.

"Doctors are working hard to uncover the causes of pre-term birth and to develop preventive treatments.

"In the meantime, the fetal fibronectin test has been found to be very accurate at predicting those women who will not imminently deliver.

"Women with a negative test can be reassured that they do not need inpatient care.

"They can therefore avoid leaving their families for observation in a hospital, though a few may need admission for pain relief.

"More importantly, unnecessary drug interventions can be prevented, which could translate into significant cost savings to the NHS."

Dr David said the study also suggested that use of the fFN test could reduce unnecessary transfer of pregnant women to hard-pressed specialist neonatal units.

Ms Maggie Blott, an obstetrician at King's College Hospital, in London, agreed that widespread use of the test could ensure that women were not given drugs or moved to specialist centres unnecessarily.

She said: "A lot of women present with possible pre-term labour, but only time will tell for certain whether they will actually give birth early.

"This test is easy to use and can give results quickly."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8399087.stm

Published: 2009/12/08 00:02:02 GMT

**Coffee 'might cut prostate risk'**

**Drinking coffee could help to cut the risk of advanced prostate cancer, a US study suggests.**

It found the heaviest consumers had a 60% lower risk of aggressive tumours than men who did not drink any coffee.

Coffee has an effect on the way the body breaks down sugar and also on sex hormone levels - both of which have been linked to prostate cancer.

The Harvard Medical School study was presented to an American Association for Cancer Research conference.

" **We would not recommend that men cultivate a heavy coffee drinking habit on the back of this research** "
Helen Rippon The Prostate Cancer Charity

Researcher Dr Kathryn Wilson said: "Very few lifestyle factors have been consistently associated with prostate cancer risk, especially with risk of aggressive disease, so it would be very exciting if this association is confirmed in other studies."

The researchers are unsure which components of coffee might have a positive effect.

However, it is known to contain many biologically active compounds, such as minerals and antioxidants, which limit damage to the tissues caused by the release of energy in cells.

The researchers documented the coffee intake of nearly 50,000 men every four years from 1986 to 2006.

They stress that more work is needed before any firm conclusion can be drawn about the beneficial effects of coffee.

But, at the very least, Dr Wilson said: "Our results do suggest there is no reason to stop drinking coffee out of any concern about prostate cancer."

**Mixed results**

Helen Rippon, of The Prostate Cancer Charity, said previous research on the effect of caffeinated drinks on prostate cancer had produced mixed results.

She said the latest study suggested drinking coffee might have a beneficial effect but more work was needed to draw firm conclusions.

She said: "We would not recommend that men cultivate a heavy coffee drinking habit on the back of this research, not least because a high caffeine intake can cause other health problems.

"However, men who already enjoy a regular cup of coffee should be reassured that they do not need to give this up for the sake of their prostate."

Jessica Harris, of the charity Cancer Research UK, said: "A number of other studies looking at coffee and prostate cancer have found that drinking coffee does not affect the risk of prostate cancer."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8395865.stm

Published: 2009/12/08 00:01:28 GMT

**Loneliness 'raises cancer risk'**

**Fresh evidence adds weight to suggestions that loneliness makes cancer both more likely and deadly.**


Work in Proceedings of the National Academy of Science shows social isolation tips the odds in favour of aggressive cancer growth.

Rodents kept alone developed more tumours - and tumours of a more deadly type - than rats living as a group.

The researchers put it down to stress and say the same may well be true in humans.

Cancer experts say more work is needed to prove such a link in people.

Lead investigator Gretchen Hermes, of Yale University, said: "There is growing interest in relationships between the environment, emotion and disease.

"This study offers insight into how the social world gets under the skin."

**Stress**

Doctors already know that cancer patients who are depressed tend to fare worse in terms of survival.

" **It's possible that stressful situations could indirectly affect the risk of cancer by making people more likely to take up unhealthy behaviours that increase their risk** "
Ed Yong Cancer Research UK

And previous research has suggested that social support can improve health outcomes for patients with breast cancer.

In the latest study, the researchers found that isolation and stress trebled the risk of breast cancer in the naturally sociable Norway rats.

Outcast rodents developed 84 times the amount of tumours as those living in tight-knit social groups, and the tumours also proved to be more aggressive.

The isolated mammals also had higher levels of the stress hormone corticosterone and took longer to recover from a stressful situation than fellow Norway rats.

The researchers ultimately hope their work will help cancer patients.

**Lifestyle**

Co-researcher Martha McClintock, a psychologist at the University of Chicago, said: "We need to use these findings to identify potential targets for intervention to reduce cancer."

Ed Yong, of Cancer Research UK, said: "This study was done in rats.

"Overall, research in humans does not suggest there is a direct link between stress and breast cancer.

"But it's possible that stressful situations could indirectly affect the risk of cancer by making people more likely to take up unhealthy behaviours that increase their risk, such as overeating, heavy drinking, or smoking."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8398728.stm

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***Reading in the Brain***

By STANISLAS DEHAENE
Reviewed by Jonah Lehrer


**Right** now, your mind is performing an astonishing feat. Photons are bouncing off these black squiggles and lines -- the letters in this sentence -- and colliding with a thin wall of flesh at the back of your eyeball. The photons contain just enough energy to activate sensory neurons, each of which is responsible for a particular plot of visual space on the page. The end result is that, as you stare at the letters, they become more than mere marks on a page. You've begun to read.

Seeing the letters, of course, is just the start of the reading process. As the neuroscientist Stanislas Dehaene reveals in his fascinating new book, *Reading in the Brain*, the real wonder is what happens next. Although our eyes are focused on the letters, we quickly learn to ignore them. Instead, we perceive whole words, chunks of meaning. (The irregularities of English require such flexibility. As George Bernard Shaw once pointed out, the word "fish" could also be spelled *ghoti*, assuming that we used the *gh* from "enough," the *o* from "women," and the *ti* from "lotion.") In fact, once we become proficient at reading, the precise shape of the letters -- not to mention the arbitrariness of the spelling -- doesn't even matter, which is why we read word, WORD, and WoRd the same way.

**In** this clearly written summary of the field, Dehaene is primarily interested in two separate mysteries. The first mystery is how the individual human brain learns to read. What changes take place inside our head between kindergarten and second grade, when most of us start to take literacy for granted? How do we go from sounding out syllables, carefully parsing the phonetics of each word, to becoming fluent readers? And how does this incredibly complicated act become automatic, so that evn ths sntnce cn b quikly undrstd?

Dehaene begins by introducing the reader to the "letterbox area," a small bit of brain just behind the left ear. The crucial role of this cortical part was first revealed by Mr. C, a 19th-century neurological patient who, after a mild stroke, lost the ability to read. What made Mr. C's case so peculiar is that his vision was perfectly fine; he could make sense of objects and faces and even numbers. However, when he opened up a book or glanced at a newspaper, the letters on the page were utterly inscrutable, a mess of inchoate lines and curves. "He [Mr.C] thinks that he has lost his mind," his doctor dryly noted.

Subsequent studies of patients with pure alexia -- they can see everything but written language -- have located the specific contours of the letterbox area. Not surprisingly, it takes up a significant chunk of our

visual cortex, as the invention of the alphabet seems to have usurped brain cells previously devoted to object recognition. (Dehaene refers to this process as "neuronal recycling.") He also speculates that, while "learning to read induces massive cognitive gains," it also comes with a hidden mental cost: because so much of our visual cortex is now devoted to literacy, we're less able to "read" the details of natural world.

But reading isn't just about seeing -- we still have to imbue those syllabic sounds with meaning. This is why, once the letterbox area deciphers the word -- this takes less than 150 milliseconds -- the information is immediately sent to other brain areas, which help us interpret the semantic content. Such a complex act requires a variety of brain areas scattered across both hemispheres, all of which must work together to make sense of a sentence. If any of these particular areas are damaged, people tend to lose specific elements of language, such as the ability to conjugate verbs or decipher metaphors.

One of the most intriguing findings of this new science of reading is that the literate brain actually has two distinct pathways for reading. One pathway is direct and efficient, and accounts for the vast majority of reading comprehension -- we see a group of letters, convert those letters into a word, and then directly grasp the word's meaning. However, there's also a second pathway, which we use whenever we encounter a rare and obscure word that isn't in our mental dictionary. As a result, we're forced to decipher the sound of the word before we can make a guess about its definition, which requires a second or two of conscious effort.

**The** second major mystery explored by Dehaene is how reading came to exist. It's a mystery that's only deepened by the recency of literacy: the first alphabets were invented less than 4,000 years ago, appearing near the Sinai Peninsula. (Egyptian hieroglyphic characters were used to represent a Semitic language.) This means that our brain wasn't "designed" for reading; we haven't had time to evolve a purpose-built set of circuits for letters and words. As Deheane eloquently notes, "Our cortex did not specifically evolve for writing. Rather, writing evolved to fit the cortex."

Deheane goes on to provide a wealth of evidence showing this cultural evolution in action, as written language tweaked itself until it became ubiquitous. In fact, even the shape of letters -- their odd graphic design -- has been molded by the habits and constraints of our perceptual system. For instance, the neuroscientists Marc Changizi and Shinsuke Shimojo have demonstrated that the vast majority of characters in 115 different writing systems are composed of three distinct strokes, which likely reflect the sensory limitations of cells in the retina. (As Dehaene observes, "The world over, characters appear to have evolved an almost optimal combination that can easily be grasped by a single neuron.") The moral is that our cultural forms reflect the biological form of the brain; the details of language are largely a biological accident.

Deheane ends the book with a discussion of education -- he's a supporter of phonics and ridicules the whole-language method, "which does not fit with the architecture of our visual brain." It's an interesting chapter, and it's always nice to see scientists grapple with the practical implications of their work, but the most compelling themes of the book remain rooted in basic science. As Deheane and others have demonstrated, the brain is much more than the seat of the soul -- it's also the fleshy source of our culture. By studying the wet stuff inside our head, we can begin to understand why this sentence has this structure, and why this letter, this one right here, has its shape.

http://bnreview.barnesandnoble.com/t5/Reviews-Essays/Reading-in-the-Brain/ba-p/1776

**Sexes' danger reactions 'differ'**

**Men and women may respond differently to danger, a brain scan study suggests.**


A team from Krakow, in Poland, used functional magnetic resonance imaging (fMRI) to assess brain activity when 40 volunteers were shown various images.

Men showed activity in areas which dealt with what action they should take to avoid or confront danger.

But the study, presented to the Radiological Society of North America, found more activity in the emotional centres of women's brains.

The researchers, from Jagiellonian University Hospital in Krakow, carried out scans on 21 men and 19 women.

Brain activity was monitored while the volunteers were shown images of objects and images from ordinary life designed to evoke different emotional states.

**Fight or flight response**

The images were displayed in two runs. For the first run, only negative pictures were shown. For the second run, only positive pictures were shown.

While viewing the negative images, women showed stronger and more extensive activity in the left thalamus.

This is an area which relays sensory information to the pain and pleasure centres of the brain.

Men showed more activity in an area of the brain called the left insula, which plays a key role in controlling involuntary functions, including respiration, heart rate and digestion.

In essence, activity in this area primes the body to either run from danger, or confront it head on - the so-called "fight or flight response".

Researcher Dr Andrzej Urbanik said: "This might signal that when confronted with dangerous situations, men are more likely than women to take action."

**Positive images**

While viewing positive images, women showed stronger activity in an area of the brain associated with memory.

With men, the stronger activity was recorded in an area associated with visual processing.

Dr Urbanik believes these differences suggest women may analyse positive stimuli in a broader social context and associate positive images with a particular memory.

For instance, viewing a picture of a smiling toddler might evoke memories of a woman's own child at this age.

Conversely, male responses tend to be less emotional.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8380429.stm

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**Dogs vs cats: The great pet showdown**

- 09 December 2009 by **Kate Douglas**
- Magazine issue 2738.

Fight! (Image: Cultura/Corbis)

THE world is divided into "dog people" and "cat people", each passionately believing that their preferred pet is superior. Until a decade ago, there was very little scientific evidence either camp could muster to support its claims. Then animal behaviourists became interested in dogs and unleashed a pack of ingenious experiments testing canine capabilities and cognition. Recently, researchers have started doing similar work with cats. Could it be time for that showdown?

There are obvious pitfalls in trying to use science to resolve this perennial dispute. Every pet-owner knows their furry family member is special - a unique being with its own talents and foibles. Yet scientific research tends to look at species as a whole and deals in averages and trends when attempting to quantify their characteristics. Then there is the thorny issue of comparing two very different animals. Some might argue that the whole venture is doomed to failure, but here at *New Scientist* we like a challenge. So we have pitted cats against dogs in 11 categories. It's a winner-take-all competition with "best in show" being awarded to the pet that prevails in the most categories. Let the fur fly...

**1. BRAINS**

At 64 grams, the average dog brain is far bigger than its feline equivalent, which weighs in at a mere 25 grams. But then the average dog is much heavier than the average cat. If instead you measure brain mass as a percentage of body mass, cats win by a whisker.

Felophiles should not gloat yet. In general, smaller mammals have slightly larger brains relative to their body size than bigger ones. This means cats' brains are exactly the mass you would expect for their size, whereas dogs have slightly more upstairs than you would predict.

On size alone, then, the results are ambiguous. That is perhaps all to the good, because brain size is not a reliable measureof intelligence. In fact, if you want to assess smarts you are far better looking at

behaviour than crude neuroanatomy - more on that later. However, there is one anatomical measure that gives a pretty good indication of information processing capacity: the number of neurons in the cortex, or executive brain. Here cats trounce dogs, with 300 million neurons compared with a piddling 160 million (*Trends in Cognitive Science*, vol 9, p 250).

**WINNER: CATS**
**RUNNING SCORE: CATS 1 - 0 DOGS**

**2. SHARED HISTORY**

Several research teams have compared DNA from dogs with that of grey wolves, their closest living ancestor, to try to pinpoint the date of domestication.

In the first study of this kind in 1997, Robert Wayne's team at the University of California, Los Angeles, came up with a date of 135,000 years ago. Since then, the entire dog genome has been sequenced and Wayne now believes his date may be a little premature. Nevertheless, given the discovery of archaeological remains of dogs dating from 31,000 years ago and the large divergence between dog and wolf DNA, he still suspects that domestication occurred at least 50,000 years ago.

Other DNA studies, however, suggest domestication could be more recent. The latest analysis, published in September by Peter Savolainen at the Royal Institute of Technology in Stockholm, Sweden, comes in at 16,000 years. It also points to an origin south of the Yangtze river in China and speculates that the first dogs were not working dogs, but destined for the dinner table (*Molecular Biology and Evolution*, vol 26, p 2849).

Our knowledge of feline domestication is also fuzzy. Evidence from ancient Egyptian burials and hieroglyphs indicates that cats were popular in homes from about 3000 BC onwards. However, the synergy with humans probably stretches further back. As soon as our ancestors began farming, their grain stores would have become magnets for vermin, and therefore cats. In 2007, comparisons of the DNA of wildcats from across the globe with that of domestic cats confirmed their origins in the Fertile Crescent east of the Mediterranean, the cradle of agriculture (*Science*, vol 317, p 519). What's more, cats seem to have wormed their way into our homes and hearts from an early stage, as evidenced by a 9500-year-old burial of a kitten alongside a human on Cyprus. While impressive, it still leaves Felix looking like a newcomer compared with Fido.

Cats seem to have wormed their way into our homes and hearts from an early stage
**WINNER: DOGS**
**SCORE: CATS 1 - 1 DOGS**

**3. BONDING**

The bond between a dog and its owner is remarkably similar to that between a parent and child. A secure baby behaves in a characteristic way in strange situations: it is courageous and happy to explore while its mother is around, becomes distressed when she leaves, will settle with a stranger in time, but has eyes only for mum when she returns.

Dogs put through the "strange situation" test respond in the same way. That is probably no surprise to dog people, who often cite unconditional love as their pet's more endearing quality. Are cats so very different?

Adam Miklosi from Eotvos Lorand University in Budapest, Hungary, whose group did the work with dogs, tried this experiment with cats - but they were having none of it. The lab setting was very upsetting and stressful for them, presumably because cats tend not to leave their territory. Nevertheless, Miklosi suspects that cats bond with their owners in much the same way that dogs do - if only he could persuade them to take the test.

Even the most besotted owner will admit that cats like their independence. Evolution is to blame. By nature, cats are loners. Dogs, meanwhile, are descended from pack animals and have an instinct to affiliate, and domestication has changed the focus of this instinct. Give a 4-month-old puppy the choice and it will choose a human companion over a dog. It seems they just can't help but love us.

**WINNER: DOGS**
**SCORE: CATS 1 - 2 DOGS**

**4. POPULARITY**

Arguably the ultimate test of whether an animal makes a good pet is how many people actually own them. Here cats are clear winners. Although worldwide figures are hard to come by, recent studies show that in the top 10 cat-owning countries there are almost 204 million felines. Pet pooches in the top 10 dog-owning countries number fewer than 173 million.

**WINNER: CATS**
**SCORE: CATS 2 - 2 DOGS**

**5. UNDERSTANDING**

Rico the border collie is famously able to understand over 200 words (*Science*, vol 304, p 1682). He's a clever boy, but even dogs with more limited comprehension can often recognise and respond to dozens of commands and requests for objects. And words are not the only channel of communication open to them.

Pooches can follow human pointing gestures, such as an outstretched finger or a nod of the head, to find food. That may not seem impressive, but chimps struggle to do it. Dogs also hold eye contact with humans - which wolves tend not to do - and use gaze alternation to bring objects to their owner's attention. They seem predisposed to inspect our faces for information, reassurance and guidance, according to Alexandra Horowitz who studies animal cognition at Columbia University in New York, and whose book *Inside of a Dog* was published in September.

However, Horowitz provides a cautionary tale for anyone tempted to overestimate their dog's level of comprehension. Her experiments revealed that a pooch's characteristic "guilty look" does not in fact signify an understanding of transgression, but is often simply produced in response to a scolding, regardless of whether or not it has been disobedient (*Behavioural Processes*, vol 81, p 447).

Cognitively speaking, cats are similar to dogs, says Miklosi, so you would expect them to have similar patterns of behaviour and abilities. A big difference is that they are not compliant or motivated, making them devilishly hard to work with. Nevertheless, Miklosi's team found that Felix is just as capable as Fido when it comes to following pointing gestures to find food. However, if the food is hidden and impossible to retrieve, dogs are far more likely to solicit help from their owners by gaze alternation, whereas cats mostly try in vain to obtain the reward for themselves (*Journal of Comparative Psychology*, vol 119, p 179). Understanding that humans can get you what you want may seem like cheating, but add to this the dog's superior vocabulary and eagerness to engage with its owner and it is only fair they win this one.

**WINNER: DOGS**
**SCORE: CATS 2 - 3 DOGS**

**6. PROBLEM SOLVING**

"Cats don't understand string theory" ran the headlines earlier this year after an experiment showed that if you offer kitty a choice between two pieces of string, one with a morsel of food at the end, they often fail to pull on the string attached to the reward (*Animal Cognition*, vol 12, p 739). Before canine-lovers crow... dogs do not pass the test either.

What's more, neither pet can use figurative cues to find hidden food. In other words, they don't understand X marks the spot. On the positive side, both are pretty good at retrieving bits of food from stashes placed at various distances from each other and from themselves. Although they employ slightly different strategies, their choices about the order in which they visit sites is efficient and logical (*Behavioural Processes*, vol 73, p 22).

Not much else is known of cats' problem-solving capabilities. Dogs have been subjected to far more testing, and have often failed to shine. In fact, there is a long-standing view that dogs are dunces compared with their wolf cousins, whose brains are a third bigger. One classic study showed that wolves learned to open a door with a complicated catch simply by watching another wolf do it, whereas dogs failed to master the catch even after years of seeing the door opened and closed.

But Miklosi, along with Jozsef Topal of the Hungarian Academy of Sciences in Budapest, suspected that a dog's partnership with its owner might be making it appear more stupid than it really is. The more intimate the bond, they reasoned, the more likely a dog is to relinquish its powers of independent thought and action to its owner.

Their suspicions were confirmed when they tested a variety of dogs on a task in which they had to pull on the handles of a plastic dish protruding from underneath a wire fence to retrieve some food. The most highly bonded dogs performed worst - but their success rate improved as soon as their owners encouraged them. The researchers conclude that dogs are not poor problem solvers, per se, but tend to favour a collaborative approach.

The full genius of this strategy is only revealed when you consider seeing-eye dogs. In their collaborations with blind owners, they often take the usual canine role of junior partner, but when the need arises they step in to solve problems their human cannot master. Chalk one more up to the small-brained wolf.

**WINNER: DOGS**
**SCORE: CATS 2 - 4 DOGS**

**7. VOCALISATION**

Shared ancestry means that all mammals tend to produce the same kinds of vocalisations to convey certain meanings. For example, they make sudden sounds with rising or rapidly fluctuating pitch to attract attention or demonstrate arousal, motivation or readiness. Both cats and dogs play on this mammalian mutual understanding in their vocal interactions with humans. Analysis of cat miaows reveals that they contain acoustic patterns that grab our attention. But the vocal repertoire of cats is quite limited and their calls tend to be idiosyncratic, so they are often interpretable only by their owners.

Dogs have far more vocal flexibility. They can vary the length, range, pitch, frequency modulation and tonality of their barks and they use this ability to produce characteristic barks in different situations. Even someone who has never owned a dog can make a good stab at telling, simply from its barks, whether it is lonely, aggressive or happy. Miklosi's group, who made this discovery, point out that other adult canids, including wolves, rarely bark. He suggests that during the course of domestication dogs may have evolved their elaborate vocal repertoire especially to communicate with us (*New Scientist*, 12 June 2004, p 52).

That's clever, but complexity is not everything. After all, no matter how much you love your pet, the barking or miaowing can get on your nerves. It looks as though cats may have found a way around this, though. A study published earlier this year reveals the subtlety with which they can use their crooning to ensnare us. By embedding an urgent high-frequency miaow into a blissed-out purr, they produce a sound that brings out our nurturing side. Karen McComb from the University of Sussex in

Falmer, UK, who analysed these "solicitation purrs", suggests they work on a subliminal level in much the same way as a baby's cry, which has a similar frequency range (*Current Biology*, vol 19, p R507). For their guile, cats get the cream.

**WINNER: CATS**
**SCORE: CATS 3 - 4 DOGS**

**8. TRACTABILITY**

Dogs are easy to train because we have selected them to be so. They have evolved to fit into our homes and meet our needs, and they find it easy to learn and obey our rules. They are especially skilled at cognitive tasks that require cooperation and sharing information to achieve a goal.

While other animals such as chimps and dolphins learn by emulation - watching another individual carry out a task and then trying to achieve the same result - dogs learn in the same way as human infants. This process, called pedagogy, entails implicit teaching, with the dog attending to cues such as eye contact, gesture and vocalisation, and then directly imitating the actions of its master (*New Scientist*, 23 August 2008, p 33).

The most basic way to train a dog involves reinforcing the behaviours we want to encourage by giving Fido a titbit of food. Cats can be taught using rewards too. "They respond to stimulus and reinforcement," says Miklosi. But since no one has really tried training cats, we do not know the full extent of their abilities. Although there may be fewer ways to do it, they can probably achieve similar ends to dogs, Miklosi believes. "But dogs really want to do it. They are more interested and take it more seriously."

Besides, even without explicit instructions dogs naturally pick up the rules of domestic behaviour. This happens through play, according to renowned animal behaviourist Marc Bekoff of the University of Colorado, Boulder. He argues that the function of rough-and-tumble play is to develop a rudimentary sense of morality, and that such interactions with their owners allow dogs to test the limits of what is acceptable in a domestic setting. Dogs win paws down.

**WINNER: DOGS**
**SCORE: CATS 3 - 5 DOGS**

**9. SUPERSENSES**

Smell, sight and hearing are the most important senses for both cats and dogs. Having created endless breeds of dog to capitalise on their various perceptual talents, we should expect them to outperform the less highly selected cat - and they do show some quite amazing abilities. A bloodhound's nose, for example, contains 300 million smell receptor sites compared with just 5 million in humans. Its sense of smell is up to 100 million times more sensitive than yours.

However, while a dog's keen nose is legendary, cats are no mean sniffers either. In fact, because there is so much variability among breeds of dog, the average cat, with its 200 million smell receptors, actually has a more acute nose than the average dog.

Neither Felix nor Fido can match us when it comes to visual acuity, but their ancestry as nocturnal hunters has left them with some impressive visual abilities. Both have a faster "flicker-fusion rate" than we do, meaning the cells in their retinas take more snapshots of the world per second than ours, giving them superior sensitivity to movement. The main reason for this is that their eyes contain many more rod cells than cones, which also explains their poor colour vision. On the up side, rods are particularly good for seeing in low light. Here, once again, cats have the upper hand. Felix can see in light levels six times as low as we can, while Fido's limit is thought to be about five times ours.

Add hearing to the list, and cats score a hat trick. Their auditory range extends from 45 to 64,000 hertz, far wider than that of dogs at between 67 and 45,000 hertz.

**WINNER: CATS**
**SCORE: CATS 4 - 5 DOGS**

**10. ECO-FRIENDLINESS**

Cats love wildlife - in the UK alone they kill more than 188 million wild animals each year. But dogs are no bunny huggers. They have been implicated in the decline of the rare European nightjar, they disturb ground-nesting birds and, even when walked on a lead, their mere presence may reduce biodiversity (*Biology Letters*, vol 3, p 611).

The real difference in ecological impact comes in consumption. A medium-size dog's ecological footprint - the area of land required to keep it fed - is 0.84 hectares annually. You could run two SUVs on that and still have change. Even a toy dog such as a chihuahua has a footprint of 0.28 hectares per year. Meanwhile, your average cat's ecological pawprint, at just 0.15 hectares, looks positively virtuous (*New Scientist*, 24 October, p 46).

**WINNER: CATS**
**SCORE: CATS 5 - 5 DOGS**

**11. UTILITY**

Dogs can hunt, herd and guard. They can sniff out drugs and bombs and even whale faeces; they guide blind and deaf people, race for sport, pull sleds, find someone buried by an avalanche, help children learn and possibly even predict earthquakes. Cats are good if you have an infestation of rodents.

Perhaps that assessment is unfair, though. After all, we love our pets for other reasons. Cats are beautiful and soft, and stroking them has been shown to reduce stress. Then again, dogs are also good stress-busters: owning one can lower your blood pressure and cholesterol levels. What's more, Fido has other health benefits. Daily dog walks may be a chore, but they repay the effort, not just in terms of regular exercise, but also by providing immune-boosting opportunities for social contact with other dog walkers. That's why in a head-to-head contest of health benefits, it's dogs all the way (*British Journal of Health Psychology*, vol 12, p 145).

Daily dog walks may be a chore but they provide regular exercise and immune-boosting opportunities for social contact with other dog owners
**WINNER: DOGS**
**SCORE: CATS 5 - 6 DOGS**

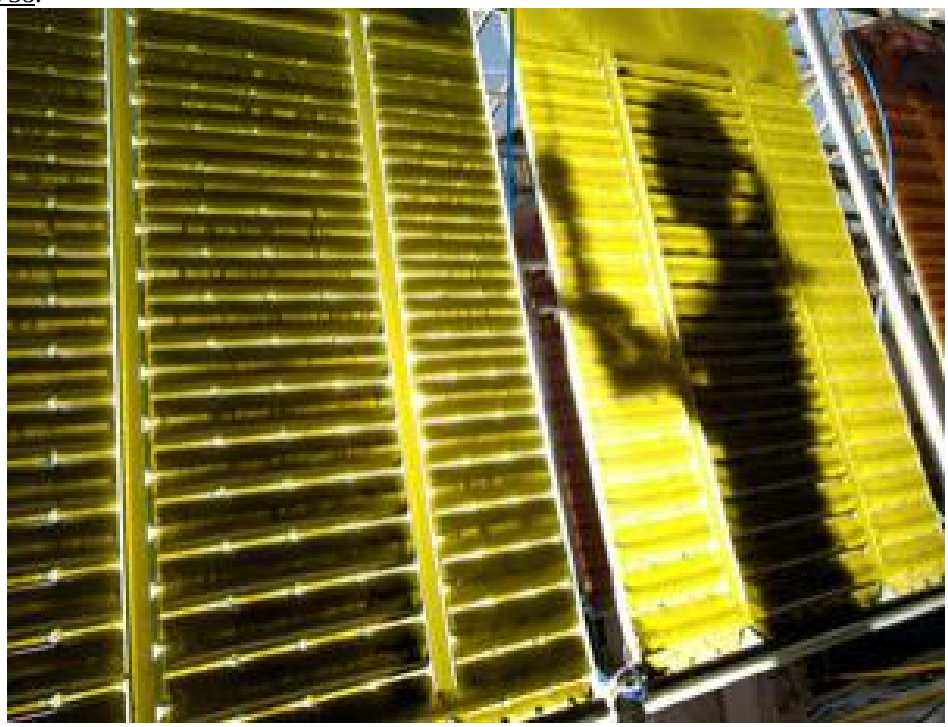
*Kate Douglas is a feature editor at New Scientist*

http://www.newscientist.com/article/mg20427381.200-dogs-vs-cats-the-great-pet-showdown.html?full=true&print=true

**The research that might save us after Copenhagen**

- 09 December 2009 by **Catherine Brahic**

Magazine issue 2738.



Second-generation biofuels such as algae could help green our future (Image: Volker Steger/SPL)

IT'S crunch time. Two years ago in a huge conference hall in Bali, after a marathon negotiating session that left some delegates in tears, envoys from 192 nations set themselves a deadline of 2009. The task in question? To come up with a way of extending the essence of the Kyoto protocol beyond 2012.

The final stages of this process kicked off in Copenhagen, Denmark, on Monday. Delegates now have until 18 December to deliver. We know that the summit won't provide a legally binding "Copenhagen protocol". That will have to wait until 2010. But it must deliver everything else. Key among the expected elements are promises from rich nations to slash their emissions, and from poor nations to slow their emissions growth. Delegates are also expected to agree to channel cash and low-carbon technologies to poorer nations to help them cope with the effects of climate change. It will go to the wire: don't expect a conclusion until the early hours of 19 December.

The fate of the planet is not solely in the hands of 192 teams of sleep-deprived politicians, however. Whatever is decided at Copenhagen, environmental awareness has increased, as has funding for low-carbon energy. Pilot projects have sprung up to capture carbon dioxide and store it underground, and alliances have formed to protect ancient forests. A new green revolution has begun, and science has its work cut out over the next decade if it is to deliver a low-carbon society. Here, *New Scientist* outlines the stepping stones.

**Low-hanging fruit**

Say "global warming" and most people think of carbon dioxide. But there are many more pollutants warming our climate, some of them both powerful and easily reduced. These include methane, carbon monoxide, and black carbon - the fine soot resulting from the incomplete combustion of fossil fuels

and the burning of biomass. Warming non-$CO_2$ pollutants have so far contributed as much to global warming as $CO_2$.

The good news is that the technology to cut emissions of non-$CO_2$ pollutants already exists. Fitting black-carbon filters on diesel vehicles worldwide would have an immediate impact on climate, for example. So could capturing methane from landfills. Electrification of rural regions in poor countries and the adoption of solar cookers could immediately reduce soot emissions from homes that use firewood and biomass for heating and cooking. That would improve the health of their occupants to boot.

*Anil Ananthaswamy*

**Location, location, location**

In September, climate policy-makers got a shock. Meeting at the World Meteorological Organization in Geneva, Switzerland, they asked scientists to forecast how climate change will pan out country by country. "No can do," came the answer: we are fairly confident about global forecasts, but not local ones.

Will Washington DC be wetter or drier, battered by hurricanes or plagued by drought? "The models have to get a lot better before they can do that," says mathematician Leonard Smith at the University of Oxford. Short-term regional forecasts could in theory be easier than long-term ones, but Philip Duffy of US-based Climate Central points out that on those timescales, natural variability may cause larger changes than human-made climate change. The politicians are not happy. They want to devise plans for adapting their countries to a changing climate, making it likely that they will push to make local forecasts better.

*Fred Pearce*

**Electric highway**

Just a few years ago, "electric vehicle" meant a golf buggy. Then the Tesla Roadster arrived. The electric sports car does 0-100 kilometres per hour in 4 seconds and has been bought by celebrities such as George Clooney. Finally, electric cars are sexy.

Charging an electric vehicle leads to extra emissions at power plants, but even the Tesla, which is built for speed rather than efficiency, produces less than half of the carbon dioxide per kilometre than the greenest petrol-powered cars. Cheaper, mass-market electric cars are on the way (see picture). The challenge is to get consumers to buy them, which will require a network of stations where drivers can top up their batteries. Enter Better Place, an ambitious start-up headed by Israeli entrepreneur Shai Agassi. Better Place is building a charging network in Denmark and says it will have several thousand electric cars on the road by 2011. If it works there, other countries should follow suit.

*Jim Giles*

**Spot the tipping point**

The race is on to find climate tipping points before it's too late. Beyond them lie runaway warming and collapsing ice sheets. Marten Scheffer of Wageningen University, the Netherlands, argues that increasingly unpredictable and extreme weather - which modellers call "flickering" - could suggest a big change is imminent. Confusingly, others argue that unexpected sluggishness or stability in the climate could be something to fear: the calm before the storm. Tim Lenton at the University of East Anglia, UK, is working on an early-warning system for climate tipping points. He says the biggest need is for better climate data, to analyse past climatic lurches and spot signs of sluggishness or flickering.

*FP*

**Hello, solar**

By one set of numbers, solar energy is the answer to climate change. The sun throws more energy at the Earth's surface in one hour than we use in an entire year. Even at the 15 to 20 per cent efficiency of current solar cells, the US could meet most of its electricity needs by placing solar panels on every suitable roof in the nation.

That hasn't happened because electricity from solar cells costs $5000 to $8000 per kilowatt, to coal's $1800. That's why just one-thousandth of US electricity came from solar sources last year. "We have such a long way to go," says Robert Hawsey at the US National Renewable Energy Laboratory in Golden, Colorado. To get prices down, engineers are building thinner solar cells, which are cheaper, and more flexible versions, which can be incorporated into roofing materials. This sort of progress should make solar cells competitive by 2015, says Hawsey.

*JG*

**Catch that carbon**

It's a biggie in energy research: capturing the carbon dioxide from power-station emissions and transporting the gas to permanent burial grounds like exhausted salt mines or oil wells. On the face of it, the technology is within reach, and with huge amounts of cheap coal still underground, the world badly needs it. But the logistics of handling billions of tonnes of gas a year are daunting. Pilot projects are under way, but the first commercial carbon capture and storage plants won't be in business until 2030 at the earliest, says a report by a team at the Massachusetts Institute of Technology entitled *The Future of Coal*. And US power generators put the R&D bill at about $20 billion. If we could grow biofuels, burn them and capture the emissions, we could generate energy while sucking $CO_2$ from the atmosphere - turning global warming into global cooling.

*FP*

**Clouded judgements**

When the Intergovernmental Panel on Climate Change says doubling levels of carbon dioxide will probably raise temperatures by 1.5 °C to 4.5 °C, most of that error bar is a result of uncertainty over clouds. They're too small and short-lived for easy measurement or modelling. Some warm the planet while others cool it. Climate change may create more clouds or fewer. It's all very hazy. In July, new work from the US National Center for Atmospheric Research showed global warming is resulting in fewer low clouds over the oceans - boosting warming. Models are being tweaked to take this into account. NCAR reckon it may soon be time to narrow those errors bars, closing in on 4.5 °C.

*FP*

**Biofuels, the sequel**

Biofuels have gone from green hero to zero in five years. Many trash rainforests, take land and water that would otherwise be used for growing food, or have carbon footprints as big as the fuels they replace. But it's too soon to write them off. The next five years could be make-or-break for developing less antisocial, "second generation" biofuels. Genetically engineered enzymes or chemical catalysts may soon be able to cheaply break down the cellulose in woody agricultural waste into sugars fit for fermentation. Another big breakthrough could be in processing algae grown in tanks or the ocean to turn it into ethanol or butanol.

There will inevitably be physical constraints on how much biofuel can be manufactured, which raises the question of how to best utilise it. If power stations increasingly run on renewable or nuclear fuel,

and if future cars are plug-ins charged from the grid, then maybe biofuels should be saved for shipping and applications where charging options are limited.

*FP*

**Change the Earth instead**

Call it the planet's plan B or call it plain crazy, "geoengineering" is here to stay. Few serious scientists believe that "hacking" the climate to artificially cool it is a must, but many think it should investigated seriously. There are growing signs that governments - and the military - are paying attention.

It's unclear what a plan B would look like. For that, we need to understand the side effects of different schemes. Pumping a sulphur sunshade into the atmosphere, for instance, could disrupt large weather systems. Much of this research can be done with models, but we may also need to carry out "micro-hacks" - small-scale field experiments. The trickiest challenge may be the slippery slope between small-scale experiments and large ones that have a detectable effect on weather or climate, says Ken Caldeira of the Carnegie Institution for Science at Stanford University, California. To avoid groups carrying out their own large-scale experiments unilaterally, it is vital that open discussions on regulation are held soon.

http://www.newscientist.com/article/mg20427383.600-the-research-that-might-save-us-after-copenhagen.html?full=true&print=true

**Ancient Amazon civilisation laid bare by felled forest**

- 09 December 2009 by **Linda Geddes**
- Magazine issue 2738.

Uncovering civilisation (Image: Edison Caetano)
Signs of what could be a previously unknown ancient civilisation are emerging from beneath the felled trees of the Amazon. Some 260 giant avenues, ditches and enclosures have been spotted from the air in a region straddling Brazil's border with Bolivia.

The traditional view is that before the arrival of the Spanish and Portuguese in the 15th century there were no complex societies in the Amazon basin – in contrast to the Andes further west where the Incas built their cities. Now deforestation, increased air travel and satellite imagery are telling a different story.

"It's never-ending," says Denise Schaan of the Federal University of Pará in Belém, Brazil, who made many of the new discoveries from planes or by examining Google Earth images. "Every week we find new structures." Some of them are square or rectangular, while others form concentric circles or complex geometric figures such as hexagons and octagons connected by avenues or roads. The researchers describe them all as geoglyphs.

**Garden villages**

Their discovery, in an area of northern Bolivia and western Brazil, follows other recent reports of vast sprawls of interconnected villages known as "garden cities" in north central Brazil, dating from around AD 1400. But the structures unearthed at the garden city sites are not as consistently similar or geometric as the geoglyphs, Schaan says.

"I firmly believe that the garden cities of Xingu and the geoglyphs were not directly related," says Martti Pärssinen of the Finnish Cultural and Academic Institutes in Madrid, Spain, who works with

Schaan. "Nevertheless, both discoveries demonstrate that [upland] areas of western Amazonia were heavily populated much before the European incursion."

The geoglyphs are formed by ditches up to 11 metres wide and 1 to 2 metres deep. They range from 90 to 300 metres in diameter and are thought to date from around 2000 years ago up to the 13th century.

**Human habitation**

Excavations have unearthed ceramics, grinding stones and other signs of human habitation at some of the sites but not at others. This suggests that some had purely ceremonial roles, while others may also have been used for defence.

Unusually for defensive structures, however, earth was piled up outside the ditches, and they are also highly symmetrical. "When you think about defence you're just building a wall or a trench," says Schaan. "You don't have to do calculations to make it so round or square." Many of the structures are oriented to the north, and the team is investigating whether they might have had astronomical significance.

"Many of the great early civilisations had a riverine basis and the Amazon has long been underestimated and overlooked in that sense," says Colin McEwan, head of the Americas section at the British Museum in London.

**Successful societies**

Though there is no evidence that the Amazonians built pyramids or invented written language as societies in ancient Egypt or Mesopotamia did, "in terms of a trend towards increasing social complexity and domestication of the landscape, this wasn't just a pristine forest with isolated nomadic tribes", McEwan adds. "These were substantive, sedentary and in the long term very successful cultures."

While some Inca sites lie just 200 kilometres west of the geoglyphs, no Inca objects have been found at the new sites. Neither do they seem to have anything in common with Peru's Nasca geoglyphs.

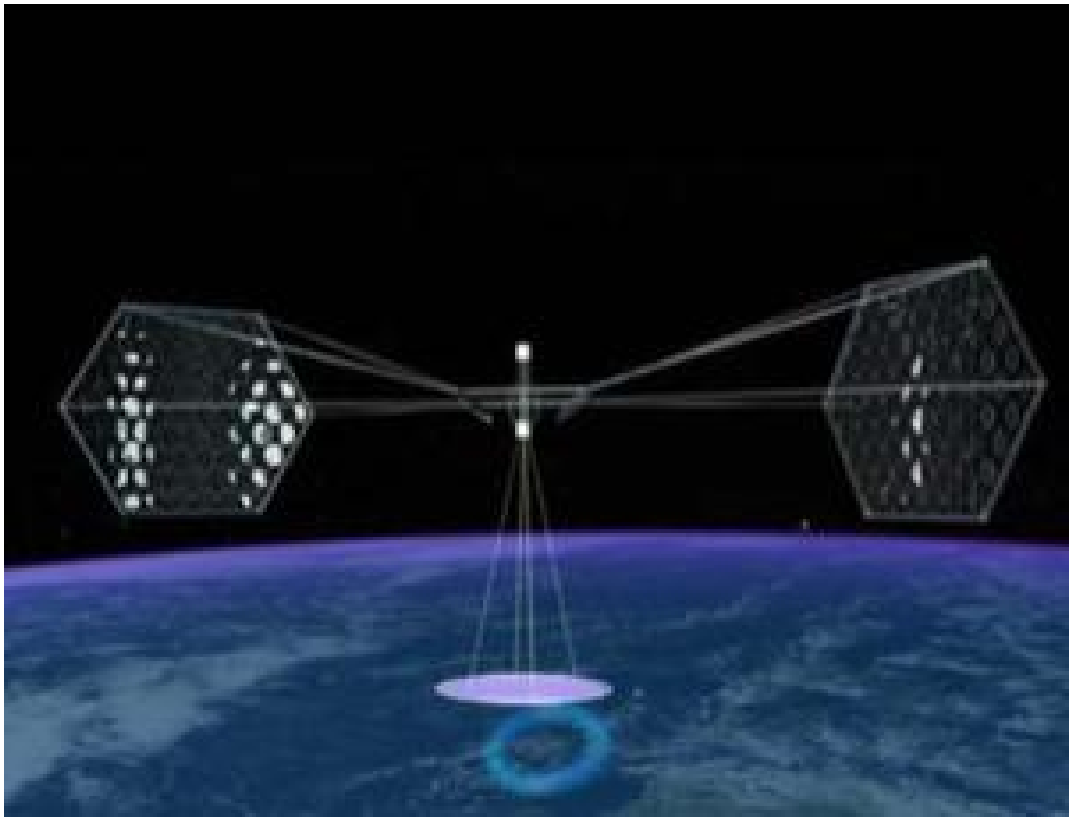
"I have no doubt that this is only scratching the surface," says Alex Chepstow-Lusty of the French Institute for Andean Studies in Lima, Peru. "The scale of pre-Columbian societies in Amazonia is only slowly coming to light and we are going to be amazed at the numbers of people who lived there, but also in a highly sustainable fashion. Sadly, the economic development and forest clearance that is revealing these pre-Columbian settlement patterns is also the threat to having enough time to properly understand them."

Journal reference: *Antiquity*, vol 83, p 1084

http://www.newscientist.com/article/mg20427383.800-ancient-amazon-civilisation-laid-bare-by-felled-forest.html?DCMP=NLC-nletter&nsref=mg20427383.800

**California gives green light to space solar power**

- 03:12 08 December 2009 by **David Shiga**



Energy beamed down from space is one step closer to reality, now that California has given the green light to a deal involving its sale. But some major challenges will have to be overcome if the technology is to be used widely.

On Thursday, the California Public Utilities Commission gave its blessing to an agreement that would see the Pacific Gas and Electric Company buy 200 megawatts of power beamed down from solar-power satellites beginning in 2016.

A start-up company called Solaren is designing the satellites, which it says will use radio waves to beam energy down to a receiving station on Earth.

The attraction of collecting solar power in space is the virtually uninterrupted sunshine available in geosynchronous orbit. Earth-based solar cells, by contrast, can only collect sunlight during daytime and when skies are clear.

**Launch costs**

But space-based solar power must grapple with the high cost per kilogram of launching things into space, says Richard Schwartz of Purdue University in West Lafayette, Indiana. Schwartz chaired a US National Academies committee that in 2001 wrote up an assessment of NASA's space-based solar power research. "If you're talking about it being economically viable for terrestrial power, it's a tough go," he says.

Cal Boerman, Solaren's director of energy services, says the company designed its satellites with a view to keeping launch costs down. "We knew we had to come up with a different, revolutionary design," he says. A patent the company has won describes ways to reduce the system's weight, including using inflatable mirrors to focus sunlight on solar cells, so a smaller number can collect the same amount of energy.

**Stay cool**

But using mirrors introduces other challenges, including keeping the solar cells from overheating, says Schwartz. "You have to take care of heat dissipation because you're now concentrating a lot of energy in one place," he says.

According to the company's patent, Solaren's solar cells will be connected to radiators to help keep them cool.

Though Boerman says the company believes it can make space-based solar power work, it is not expecting to crowd out other forms of renewable energy. Laws in California and other states require increasing use of renewable energy in coming years, he points out. "To meet those needs, we're going to need all types of renewable energy sources," he says.

http://www.newscientist.com/article/dn18247-california-gives-green-light-to-space-solar-power.html?DCMP=NLC-nletter&nsref=dn18247

**Women on testosterone only think they're macho**

- 17:20 08 December 2009 by **Ewen Callaway**

Long blamed for aggression, promiscuity and even greed, some of testosterone's alleged effects may be all in the mind.

Women who receive a boost of the potent sex hormone act more generously than women on a placebo, a new study finds. But the hormone's reputation seemed to precede itself. Those who suspected they had received bona fide testosterone acted more selfishly than those who believed they got the bogus treatment, no matter what they actually received.

"Almost everybody believes that testosterone has these aggression-enhancing effects," says Ernst Fehr, a neuroeconomist at the University of Zurich, Switzerland, who led the study.This platitude may be true in some situations, but not all. The hormone's real role is to push men and women to seek higher status, says Fehr. His team tested this hypothesis in women because previous research had established for women how long an external dose of the hormone remains in the body.

They asked 121 women given testosterone or a placebo to play a simple game in which cooperation is paramount. Called the ultimatum game, one participant is given $10 but must offer some of it to another woman. If the second woman rejects the offer, the first loses her money.

**Generous women**

If testosterone plays a role in status-seeking, participants given the hormone should fear rejection more than others and so should make more generous offers, Fehr says.That's precisely what the team found – but only after accounting for people's hunches about whether they had received testosterone or a placebo. Women on the placebo tended to offer $3.40, while those given the hormone tendered an average of $3.90.

Those who falsely believed they were on testosterone, however, offered about $1 less than women who believed they had taken the placebo.When probed on their beliefs about testosterone, participants tended to buy into conventional wisdom, saying, "Oh, testosterone would make me more egotistic, more risk-taking and more aggressive," Fehr says.

**Greedy men**

Such bias could explain the discrepancy between Fehr's study and another study presented at an October meeting. A team led by Paul Zak and Karen Redwine of Claremont Graduate University in California found that testosterone makes college-age men – those in their early 20s – act more greedily when they played a similar ultimatum game. But these researchers did not probe their participants' beliefs about testosterone."I wouldn't expect the effects to be different for males and females," says Jack van Honk, a psychologist at the University of Utrecht, the Netherlands, not involved in either study.Moreover, van Honk thinks the study shows that testosterone's reputation as an antisocial agent is wrong and that hormones can have different effects on behaviour depending on the context. "It shows, in my opinion, that you cannot talk about good and bad hormones," he says.

Journal reference: *Nature*, DOI: 10.1038/nature08711

http://www.newscientist.com/article/dn18255-women-on-testosterone-only-think-theyre-macho.html?full=true&print=true

**Dinosaur-killing impact set Earth to broil, not burn**

- 19:49 07 December 2009 by **Jeff Hecht**

Debris kicked up by a large asteroid rained back down on the Earth, heating up as it fell. But new research suggests that the first debris to re-enter the atmosphere shielded the surface from the heat of later infalling debris, preventing the world's forests from igniting (Illustration: Don Davis/NASA)
The asteroid impact that ended the age of dinosaurs 65 million years ago didn't incinerate life on our planet's surface – it just broiled it, a new study suggests. The work resolves nagging questions about a theory that the impact triggered deadly wildfires around the world, but it also raises new questions about just what led to the mass extinction at the end of the Cretaceous period.

The impact of a 10-kilometre asteroid is blamed for the extinction of the dinosaurs and most other species on the planet. Early computer models showed that more than half of the debris blasted into space by the impact would fall into the atmosphere within eight hours.

The models predicted the rain of shock-heated debris would radiate heat as intensely as an oven set to "broil" (260 °C) for at least 20 minutes, and perhaps a couple of hours. Intense heating for that long would heat wood to its ignition temperature, causing global wildfires.

Yet some species survived, and the global layer of impact debris doesn't contain as much soot as would be expected from burning the world's forests, raising questions about the extent of post-impact wildfires.

To explain the discrepancy, Tamara Goldin of the University of Vienna and Jay Melosh of Purdue University in Indiana studied how ejecta falling through the atmosphere might affect heat transfer from the top of the atmosphere to the ground. Earlier models considered only how atmospheric greenhouse gases would absorb heat.

The study reveals that the first debris to re-enter the atmosphere just a few minutes after the impact helped protect the surface from the debris that followed. "The actual ejecta themselves were getting in

the way of the thermal radiation [in the atmosphere] and shielding the Earth," Goldin told *New Scientist*.

**Burning sky**

As a result, the surface felt the full heat from the sky for only a few minutes. As more particles drifted down, they blocked more and more of the heat from above, preventing the world's forests from igniting. "With the short pulse [of intense heat], it's really hard to get ignition" far from the impact site, Goldin says.

Surface life would have been broiled, but not burnt to a crisp. Animals that were able to take refuge underground or in the water were likely able to survive the short period of intense heat, explaining why not all life was killed.

"Now we have models and data that match," says Claire Belcher of University College, Dublin, who was not involved with the study.

**Climate change**

Wendy Wolbach of DePaul University in Chicago, who in 1985 proposed that soot found at the end of the Cretaceous came from global wildfires, agrees. The heat shielding effect "makes sense", she told *New Scientist*.

Without global wildfires, other mechanisms are needed to explain the mass extinction, Belcher says. These include the idea that dust in the atmosphere cut off sunlight in an "impact winter" that lasted for years before emissions released after the impact caused long-term global warming.

Acid rain following the impact may also have played a role in the extinction, as could the additional stress on global climate from the massive volcanic eruptions that occurred 65 million years ago in India's Deccan Traps.

Journal reference: *Geology* (vol 37, p 1135)

http://www.newscientist.com/article/dn18246-dinosaurkilling-impact-set-earth-to-broil-not-burn.html?DCMP=NLC-nletter&nsref=dn18246